STEEL
The Metalworking Weekly

OCTOBER 10, 1955
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behind the scenes

Orchids Department

By the way, a fortnight or so ago we reported STEEL's winning ways in competition sponsored by the Direct Mail Advertising Association. (A first award for the second straight year in Class I, direct mail employed to create more effective personal sales contacts.) What we forgot to mention was that STEEL was the only publication to rate this award—both this year and last. In the photo below, Sal Marino, STEEL's circulation and promotion director, is getting this year's award bestowed upon him. He's on the right. Arthur W. Theiss, past president of DMAA, is the gentleman on the left.

That old business brings to mind some new business in the awards department. The Art Directors Club of Cleveland will hold its seventh annual exhibition this year at the Cleveland Museum of Art, Oct. 12 to Nov. 13. This news ordinarily wouldn't move us to turn handsprings. This year, however, the exhibition committee of the organization selected six covers (four STEEL, one *Machine Design*, one *Automation*) to hang at the show.

It ain't every day that you see the cover of a business magazine hanging from walls that hold the works of Rubens, Leonardo da Vinci, Velasquez and Rembrandt. The winning covers: Nov. 29—picture of slightly sprung oil derrick; Nov. 22—a large black stove; Dec. 27—a set of ex tags. Artist Tom Bryan dreamed and executed these splendid cov The fourth one, Dec. 20, features electric plugs. It's the work of a George (Tiger) Farnsworth, also created the *Machine Design Automation* covers.

Tricky Insert

Unless you are a student of met you have no idea of the number alloys in commercial use. One management's most sensitive jobs the selection, specification and p chase of the right metal for the

STEEL, therefore, includes a M Selector with this issue: A ten-p insert filled with tables of infor tion on newest alloys and old sta ards.

How so much information could packed into such a limited space one of the wonders of the publish business. After Allen G. Gray, te nical editor, assembled his mo mental findings, Art Director Kellogg got the job of figuring how it might be printed. Kello Dr. Gray and typographer Char Van Dame were practically stand on their heads before the insert w to press.

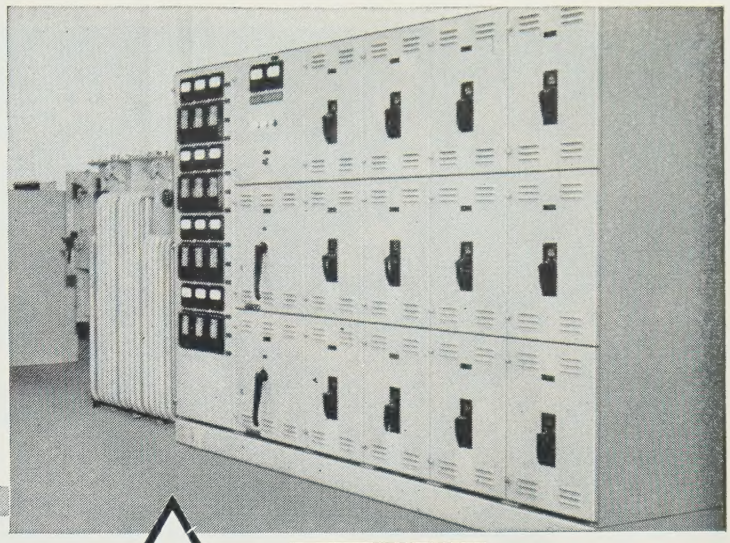
Metallic Marvels

STEEL's Metal Selector, of cou is published to coincide with coming 37th National Metal Congr and Exposition, beginning Oct. 17 Philadelphia. Naturally, only a sm percentage of the men respons for making better products fas and cheaper will be able to att the show. STEEL's big Metal Sh issue herewith presents some id that metalworking men can transl into bigger profits. For those tending the show, there is a compl technical program and a listing exhibitors.

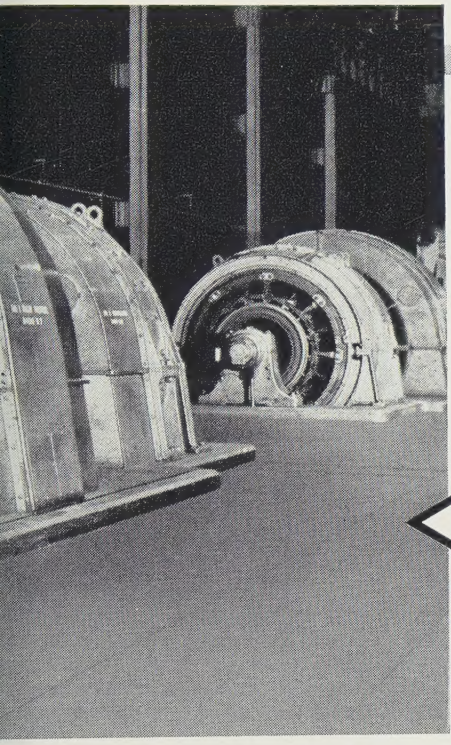
Shrdlu

(Metalworking Outlook—Page 93)

Obtain Production Year



Allis-Chalmers 1000-kva, 440-volt substation serves the cold mill at Youngstown's Indiana Harbor Works. Unit has non-flammable *Chlorextol* liquid-filled transformer. Additional substations of larger capacity are now being furnished for expansion at this plant.



These two Allis-Chalmers 6000-kw, 600-volt motor-generator sets supporting the 54-inch hot strip mill have been operating at rated capacity and above for 15 years — with minimum maintenance.

SWITCHGEAR, transformer, substation, and rectifier equipment was recently added to the growing list of Allis-Chalmers installations at The Youngstown Sheet and Tube Company's Indiana Harbor Works. These Allis-Chalmers units were specified for the new cold mill that is part of the major expansion program at the Indiana Harbor plant.

For many years, Allis-Chalmers equipment has served Youngstown well. Motor-generator sets, motors, pumps, *Texrope* drives, transformers, switchgear—all have been supplied over the years to help keep production at The Youngstown Sheet and Tube Company plants modern, flexible and economical.

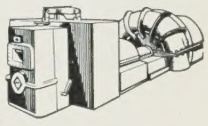
You too can take advantage of the wide range of Allis-Chalmers products and superior service . . . backed by experience gained serving the steel industry since the days of the famed Corliss engine drives. For help in planning new facilities or modernizing present plants, contact the A-C office in your district, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4836

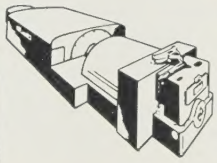
CHALMERS

Other Allis-Chalmers Equipment for the Steel Industry

Wide Range of Motors for main mill and auxiliary drives — ac or dc — from 1 hp to 10,000 hp — and supporting rectifiers or m-g sets.

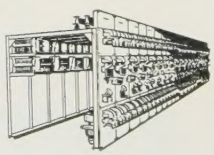
Blast Furnace Blowers are an important part of the complete A-C line of single and multi-stage centrifugal blowers, axial and rotary compressors, and vacuum pumps for the steel industry.





Power Generation Equipment includes steam turbine-generator units 2000 kw and larger for fluctuating steel mill loads. Also condensers, pumps and auxiliary drive motors.

Steel Mill Control offered by Allis-Chalmers includes constant potential and variable voltage systems, magnetic amplifier, electronic and mechanical regulators, and liquid rheostats.



Chlorextol and *Texrope* are Allis-Chalmers trademarks.

LETTERS TO THE EDITORS

Magnesium Survey Well Don

The survey, "Magnesium: A M That's Going Places," (Sept. 5, page was well done. It paints a sound but rosy picture, placing our future in hands of the people who must get and do something about it. We w appreciate 50 tear sheets for distribu purposes.

Jerry Sing
Executive Secr
Magnesium Associ
New

Article Supports Opinion

Your article, "IRS Tightens Up Leasing" (Sept. 19, page 71), was in esting. I am forming a corporation leasing equipment of my own, an bears out facts and opinions I found difficult to explain to prospec lessees. I would appreciate ten co

Don D. Sh
Manufacturers' Represent
125 W. Thir
Tulsa,

Analysis Saved Millions

We note with interest your art "Value Analysis: Equal or Better formance at Lower Costs" (Sept. page 101), No. eight in your Prog for Management series.

The material and parts analysis tion of this division has been eng in this same work for four years, savings that averaged over a mi dollars a year for the division. H you will appreciate our enthusiasm. we have three copies? We plan to tribute them to our plants in this

G. E. Ch
Super
Material & Parts Analysis Se
Division Controller's
General Mfg. Div
Ford Moto

Quicker Carbide Casting

Where can we obtain more info tion on the resistance furnace me described in the Technical Out column of Sept. 12 (page 97)? It in the paragraph, "Quicker Carbi

Carl L. Ro
Engineering Depar
Severance Tool Industries
Saginaw,

• *Write Ralph Abos, president, ponent Parts Co., Whittier, Calif.*

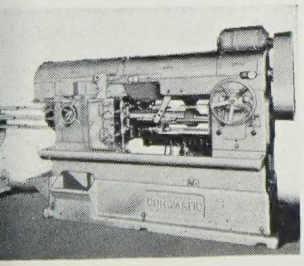
Hassle, Not Hassel

We invented the word, "hassle." won't find it in your dictionary, b so adequately describes what goes modern industrial life that it will doubtedly become an established

(Please turn to page 12)

If you haven't read this important
booklet, your production line may be
operating at less than peak efficiency. Your operations
may be beating competition with HSS today,
but you will likely need carbide tooling to be
the leader tomorrow.

Write for your free copy of this important booklet today!



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

LETTERS

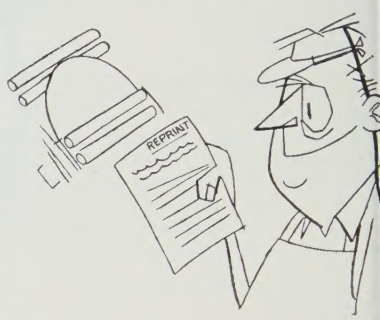
(Concluded from page 10)

It is coined from "harangue" (ran
speech) and "tussle" (rough con
versy).

It is an apt word so we, as purists,
ject to the misspellings and misuse
the word that have come to our
tention. "Hastel," "hassel" or "ha
are wrong. Please inform your read

Jack Usher Mowll & George B. F
Technical Publications G
Manufacturing Div
Glenn L. Martin
Baltir

Firm Wants to Reprint



We would like to use the article, "
por Degreasing Earns Its Keep," (S
13, 1954, page 124) in our house or
Modern Metal Finishing. This pu
cation is mailed to about 17,000 pers
nel in the metalworking industry. M
we have permission to reprint?

Richard W. Lounsb
Advertising Departm
E. I. Du Pont de Nemours &
Wilmington,

• *Permission granted.*

Adverse Reaction to Zinc?

I have noted with interest the arti
"A Lifetime of Corrosion" (Sept.
page 118).

Weathering tests at the three test s
show that zinc (prime western)
the greatest weight loss. This is not
expected since zinc, particularly a
coating finish, usually offers the gr
est sacrificial protection.

Some might have an unfavorable
action to zinc coatings of the Hot
Galvanizers Association process a
seeing the chart. I would apprec
your opinion as to whether zinc is
best rust resistant coating.

Stuart J. Swen
Secretary-Treas
American Hot Dip Galvanizers Association
Pittsbu

• *We suggest you write directly to
person who reported the zinc resu
E. A. Anderson, New Jersey Zinc
Palmerton, Pa.*

Pattern Maker Located

What is the address of the Elw
Pattern Works mentioned in the art
"Vacuum Brightens Metal Pictu
(Sept. 19, page 126)? This article
told about a product called Narli
made by NRC. What is the name
address of NRC?

J. D. K
Industrial Engi
Radio & Television Div
Sylvania Electric Products
Williamsport,

• *The Elwood Pattern Works is
125 N. East St., Indianapolis 4,
NRC is the National Research Co
160 Charlemont St., Newland Hei
61, Mass.*

adish pioneering in tremendous closed-impression-die forgings offers engineers ew freedom in extending the inherent advantages of the drop forging process to ntricately shaped parts weighing as much as *10,000 pounds*. Drop Forging close-to-nish dimensions materially reduce metal and machining costs . . . while improvement n dynamic strength and toughness makes possible substantial reductions in dead veight . . . and higher factors of safety.

A discussion of your products with a Ladish forging engineer will provide spe-ific data on the ultimate economy and improvement in design you can impart to our own products by specifying forgings . . . Ladish Controlled Quality forgings.

WITH CLOSED-IMPRESSION-DIE DROP FORGINGS WEIGHING UP TO 10,000 LBS

TANIUM PROPELLER BLADE

ain Ladish pioneers with the largest known anium forging produced in closed-impression s. 40% saving in weight realized by forging s 100-inch blade in "wonder metal" Titanium.

IND TUNNEL BLADE

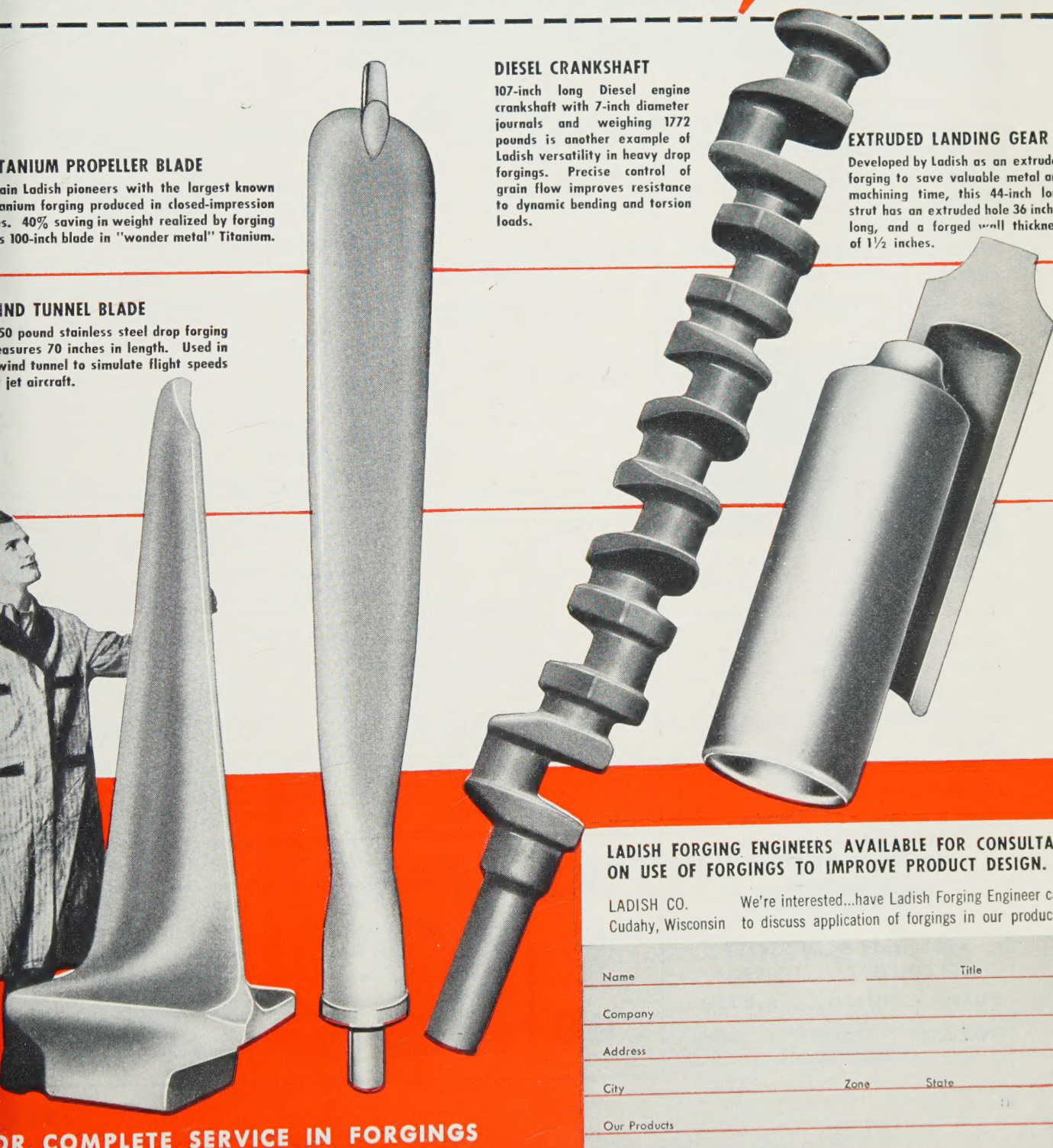
50 pound stainless steel drop forging easures 70 inches in length. Used in wind tunnel to simulate flight speeds jet aircraft.

DIESEL CRANKSHAFT

107-inch long Diesel engine crankshaft with 7-inch diameter journals and weighing 1772 pounds is another example of Ladish versatility in heavy drop forgings. Precise control of grain flow improves resistance to dynamic bending and torsion loads.

EXTRUDED LANDING GEAR

Developed by Ladish as an extrud forging to save valuable metal a machining time, this 44-inch lo strut has an extruded hole 36 inch long, and a forged wall thickne of 1½ inches.



OR COMPLETE SERVICE IN FORGINGS

LADISH FORGING ENGINEERS AVAILABLE FOR CONSULTA ON USE OF FORGINGS TO IMPROVE PRODUCT DESIGN.

LADISH CO.
Cudahy, Wisconsin

We're interested...have Ladish Forging Engineer c to discuss application of forgings in our produc

Name _____ Title _____

Company _____

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Our Products _____

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CALENDAR
OF MEETINGS

Oct. 10-12, American Mining Congress: 1955 metal and nonmetallic mining convention, Las Vegas, Nev. Congress' address: 1102 Ring Bldg., Washington, D. C. Executive vice president: Julian D. Conover.

Oct. 10-12, American Society of Lubrication Engineers and American Society of Mechanical Engineers: Joint lubrication conference, Antlers hotel, Indianapolis. Information: American Society of Lubrication Engineers, 84 E. Randolph St., Chicago 1, Ill. Secretary: William P. Youngclaus Jr.

Oct. 10-12, Truck Body & Equipment Association Inc.: Annual convention and exhibit, Morrison hotel, Chicago. Association's address: 1616 K St. N.W., Washington 6, D. C. Executive manager: Arthur H. Nuesse.

Oct. 11-15, Society of Automotive Engineers Inc.: Aeronautic meeting, aircraft production forum and engineering display, Hotel Statler, Los Angeles. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: John A. C. Warner.

Oct. 12-14, Gas Appliance Manufacturers Association: Annual meeting, El Mirador hotel, Palm Springs, Calif. Association's address: 60 E. 42nd St., New York 17, N. Y. Secretary: H. Leigh Whitelaw.

Oct. 13-15, Foundry Equipment Manufacturers Association Inc.: Annual meeting, the Greenbrier, White Sulphur Springs, W. Va. Association's address: One Thomas Circle, Washington 5, D. C. Secretary: C. R. Heller.

Oct. 14-16, Metal Treating Institute: Annual meeting, Warwick hotel, Philadelphia. Institute's address: 271 North Ave., New Rochelle, N. Y. Secretary: C. E. Herington.

Oct. 16-18, Conveyor Equipment Manufacturers Association: Annual meeting, the Greenbrier, White Sulphur Springs, W. Va. Association's address: One Thomas Circle, Washington 5, D. C. Executive vice president: R. C. Sollenberger.

Oct. 17-18, American Coke & Coal Chemicals Institute: Annual meeting, the Greenbrier, White Sulphur Springs, W. Va. Institute's address: 711 14th St. N.W., Washington 5, D. C. President: Samuel Weiss.

Oct. 17-18, Boston Conference on Distribution: Hotel Statler, Boston. Information: Daniel Bloomfield, director, 80 Federal St., Boston 10, Mass.

Oct. 17-19, American Management Association: Office management conference, Hotel Statler, New York. Association's address: 330 W. 42nd St., New York 36, N. Y. Vice president: James O. Rice.

Oct. 17-21, National Metal Congress & Exposition: Commercial Museum and Convention Hall, Philadelphia. Information: American Society for Metals, 7301 Euclid Ave., Cleveland 3, O. Secretary: W. H. Eisenman.

Oct. 17-21, American Society for Metals: Annual meeting and exhibit, Benjamin Franklin hotel, Philadelphia. Society's address: 7301 Euclid Ave., Cleveland 3, O. Secretary: W. H. Eisenman.

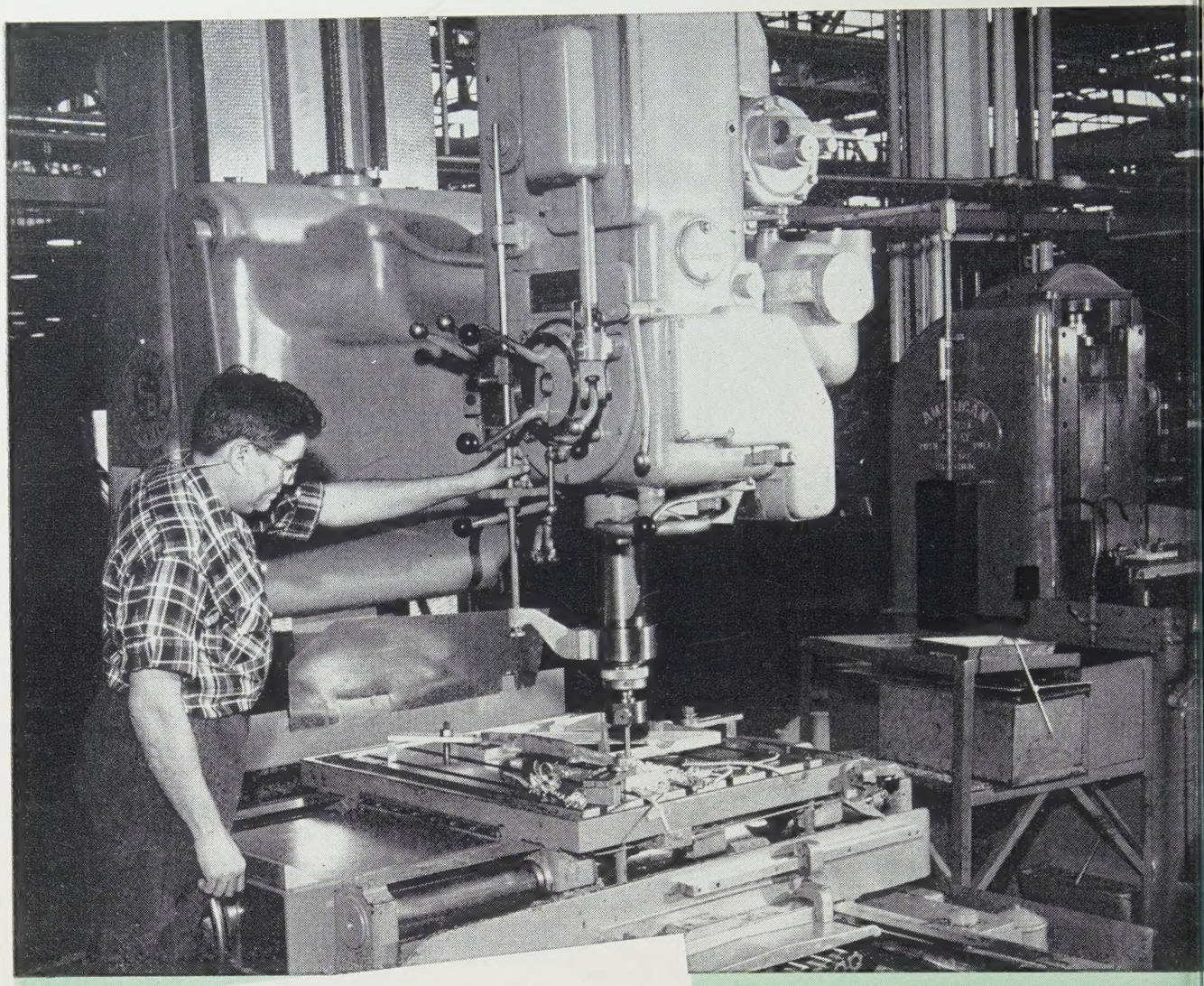
Oct. 17-21, American Welding Society: National fall meeting, Bellevue Stratford hotel, Philadelphia. Society's address: 33 W. 39th St., New York 18, N. Y. Secretary: J. G. Magrath.

Oct. 17-21, Society for Nondestructive Testing: Fall technical meeting, Sylvania hotel, Philadelphia. Society's address: 1109 Hinman Ave., Evanston, Ill. Secretary: Philip D. Johnson.

Oct. 17-21, National Safety Congress & Exposition: Conrad Hilton, Congress, Morrison and LaSalle hotels, Chicago. Information: R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Oct. 18-19, American Management Association: Special packaging conference, Hotel Commodore, New York. Association's address: 330 W. 42nd St., New York 36, N. Y. Vice president: James O. Rice.

Oct. 19-20, American Society of Mechanical Engineers: Fuels-coal conference, Neil house, Columbus, O. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: C. E. Davies.



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Let a Bullard Representative analyze what this machine can do on your work or write to


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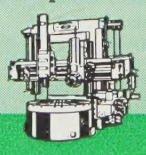
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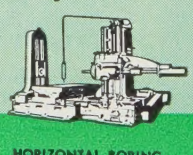
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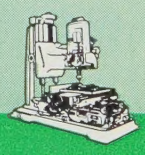
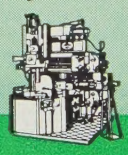
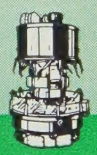

SPACING TABLE


MAN-AU-TROL


MULT-AU-MATIC

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Metalworking Outlook

Tool Shipments Sharpen Up

Look for 1955 machine tool orders to reach $800 million, topping an earlier forecast of $700 million. Tool orders in 1954 totaled only $560.4 million. Good results at the machine tool show account for the improvement this year. Machine tool shipments, slowed during the summer months by plant vacations and pre-show preparations, turned slightly higher in August, at $48.8 million. Count on a steady increase in shipments for the rest of the year.

Ford: Expanding Again

Ford Motor Co. will spend $500 million for expansion in 1956. The money will come from earnings, not borrowings. Henry Ford II made the announcement of the record plans at the opening of the new Ford assembly plant at Mahwah, N. J. By 1988, an estimated 8 million vehicles will be turned out at the facility which will contribute nearly $18 million to the nation's economy.

Money Talks

Here's a look at the future by still another Ford, James D., assistant treasurer of National Steel Corp. He predicts: $230 billion will be needed in the next decade for replacement of worn-out facilities in industry and business. An additional $350 billion will be needed to provide additional jobs and to give a solid foundation to America's rising standard of living which will increase an estimated 20 to 25 per cent in the next ten years.

Accent on Distribution

Only infrequently can the commercial publishing industry write a success story comparable to that of the Commerce department's *Distribution Data Guide*. Just a year ago, the department launched the first issue of the publication; it now has more than 10,000 subscribers. Editorially, the publication is simple. It carries annotations of current publications and a listing of reports and articles that have appeared in periodicals during the month which would appeal to people in distribution. Significance: Industry men are showing new interest in the distribution end of our economy.

Budget in the Balance

Defense department spending for August was $3125 million, an increase of more than $200 million over the spending rate in August, 1954. The increased spending level occurs for the second month in fiscal 1956 and shows the difficulty of reaching a Budget bureau target for the Pentagon of $34 billion or less. Defense spending in fiscal 1955 amounted to $35.5 billion. Treasury Secretary George Humphrey says he's still "hopeful" of a budget balance, but he also agrees that programs and force levels

nical Outlook—p. 137

Market Outlook—p. 259

should not be scaled down below those established some months ago by the President.

Easing the Nickel Pinch

Keep your eye on a research program to develop an improved method of recovering nickel and cobalt from the Nicaro laterite and serpentine ores of Cuba. If successful, the development could help relieve the nickel shortage. The program has been undertaken by the Bureau of Mines, Battelle Memorial Institute and the Nickel Processing Corp., current operator of the government-owned Nicaro property. The work is under contract with the General Services Administration.

Flood Control: Bogged Down?

How well along are we in our flood control programs? Not too far, reports Lt. Gen. S. D. Sturgis Jr., chief of engineers, U.S. army. In the U.S. no major river-basin program is more than half complete. Of the $9 billion worth of "active" projects—developments authorized by Congress—only $3.6 billion, or a little more than one-third, have been built. Says the general: "Either the memory of man is short or he has an abiding faith that the good Lord is only going to use one-third size floods in the future."

Workingman's Wage

A U.S. worker employed in manufacturing can buy one of the three leading low-priced American cars (standard four-door sedan, no "extras") for the equivalent of about 28 weeks of work. The National Industrial Conference Board reports that the United Kingdom employee would have to work nearly 42 normal U.S. (40-hour) workweeks and the German worker about 61 weeks to purchase their new cars.

Red Feather Wrinkle

With Red Feather campaigns coming up, you may want to take a tip from Chicago Screw Co. and Local 59 of the UAW-CIO. Some 1600 employees in the first and second shifts will work special 4-hour tricks Saturday, Oct. 22. All or any part of the extra pay may be contributed by the workers to the chest. Also the company makes a contribution (last year it was $10,000), based largely upon the extra day's income. That sum is distributed proportionately to the fund of the community which the individual employee designates.

Straws in the Wind

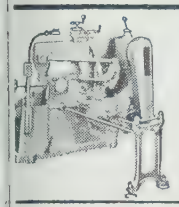
National Lead Co. has discovered new deposits of titanium ore in Norway, New York and Florida . . . Goodyear Tire & Rubber Co. is spending $100 million in a two-year expansion . . . More than half the members of the United Auto Workers are now under SUP . . . The Treasury and the Department of Health, Education & Welfare in the next session of Congress will push H.R. 7770. It would reduce paper work required of employers in reporting social security taxes.

Metal Sawing is of many types

uiring, for efficiency, sawing machines of varying characteristics, acities, feed pressures, speeds . . . even different blade actions. complete MARVEL Line comprises various basic types of metal ing machines to meet the requirements of all shops.

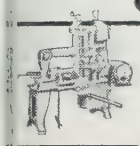
Engineered to your jobs by a MARVEL Sawing Engineer, a MARVEL Saw is certain to lower your sawing costs (both blade cost and cost per piece); to cut-off more accurately (both in length and squareness) and to out-produce any other sawing machine of comparable specifications.

PRODUCTION HACK SAWS



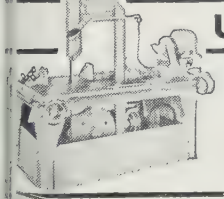
TYPE	CAPACITY	MODEL	GENERAL APPLICATION
HACK SAW Single Cut	6″ x 6″	No. 6	These machines embody all of the modern design features of fine machine tools. They are recommended for constant heavy duty service, cutting all types of machinable metals. They should be selected whenever the work demands speed, accuracy, and stamina.
	10″ x 10″	No. 9	
HACK SAW Automatic Bar Feed	6″ x 6″	No. 6A	These automatic MARVEL saws use the No. 6 and No. 9 as a basic unit, but are modified to include an automatic mechanical bar feeding mechanism. Their purpose is to automatically "cut-up" long bars into multiple short length pieces without constant attention of an operator.
	10″ x 10″	No. 9A	
HACK SAW Dual Bar Feed	10″ x 10″	No.9A3	The No. 9A3 machine combines full automatic operation and manually controlled power bar feed, the latter for lengths beyond practicability of full automatic operation.
HACK SAW Hydraulic Roll Stroke Single Cut	18″ x 18″	No. 18	These big saws are proof that the hack saw method is the most practical for cutting off big pieces of the toughest steels. Low investment, economical operating and maintenance cost, accuracy and cutting speed make these machines an ideal tool for the steel mill, warehouse and forge shop.
	24″ x 24″	No. 24	
HACK SAW Power Work Handling Type	18″ x 18″	No.18B	The No. 18-B is a special structural saw, primarily designed to obtain accuracy to such a degree in cutting structural shapes that subsequent face milling is not required.

GENERAL PURPOSE HACK SAWS



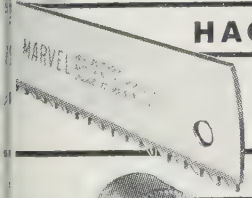
TYPE	CAPACITY	MODEL	
HACK SAW Single Cut	6″ x 6″	No. 4B	This saw is fast, accurate, yet moderately priced. For intermittent service, to cut off all types and shapes of machineable metal. Recommended for use in the tool room, maintenance department, and machine shop.
HACK SAW Single Dry Cut	4″ x 4″	No. 1	The most popular mechanical saws on the market for occasional cut-off work. Sturdily built, easy to operate, low in price, they are ideal for the small shop where speed is not essential.
	6″ x 6″	No. 2	

UNIVERSAL BAND SAW



TYPE	CAPACITY	MODEL	
BAND SAW	18″ x 18″	No. 8	The MARVEL No. 8 Band Saw is designed primarily for universal work. It will trim, miter, notch and cut-off bar stock, pipe, structural sections, mouldings and tubing. No other saw of any type is capable of handling the wide range of unusual cutting jobs possible on this very versatile machine.

HACK SAW BLADES—*High-Speed-Edge*



COMPOSITE UNBREAKABLE

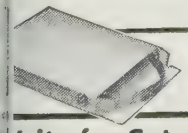
The original composite blade with a fast-cutting, long-lasting high speed steel cutting edge integrally welded to a tough, non-breakable alloy steel body. These superior blades improve the efficiency of ANY hack saw machine because they will withstand heavier feed pressure, higher tension, and faster speeds. A type and size for every hack saw, for every machineable material.

HOLE SAWS—*High-Speed-Edge*

HEAVY DUTY FOR MACHINE TOOLS

Permit sawing-out of large holes (to 4½″ dia.) in steel plate (to 1⅛″ thickness) with small capacity machine tools and portable tools. Heavy duty arbors and 1-piece floating, self-aligning, High-Speed-Edge saws. This new type hole saw, developed by MARVEL, provides a fast, low-cost method for making large holes, an operation previously requiring much machining or large equipment.

BAND SAW BLADES



WELDED TO SIZE INDIVIDUALLY PACKAGED

Through exhaustive tests MARVEL has determined the type of set—raker or wavy—best suited for all-around cutting on every standard make and model metal band saw. These exactly suited blades come welded to size, ready for use, and individually packaged.

Write for Catalog

ARMSTRONG-BLUM MFG. CO.

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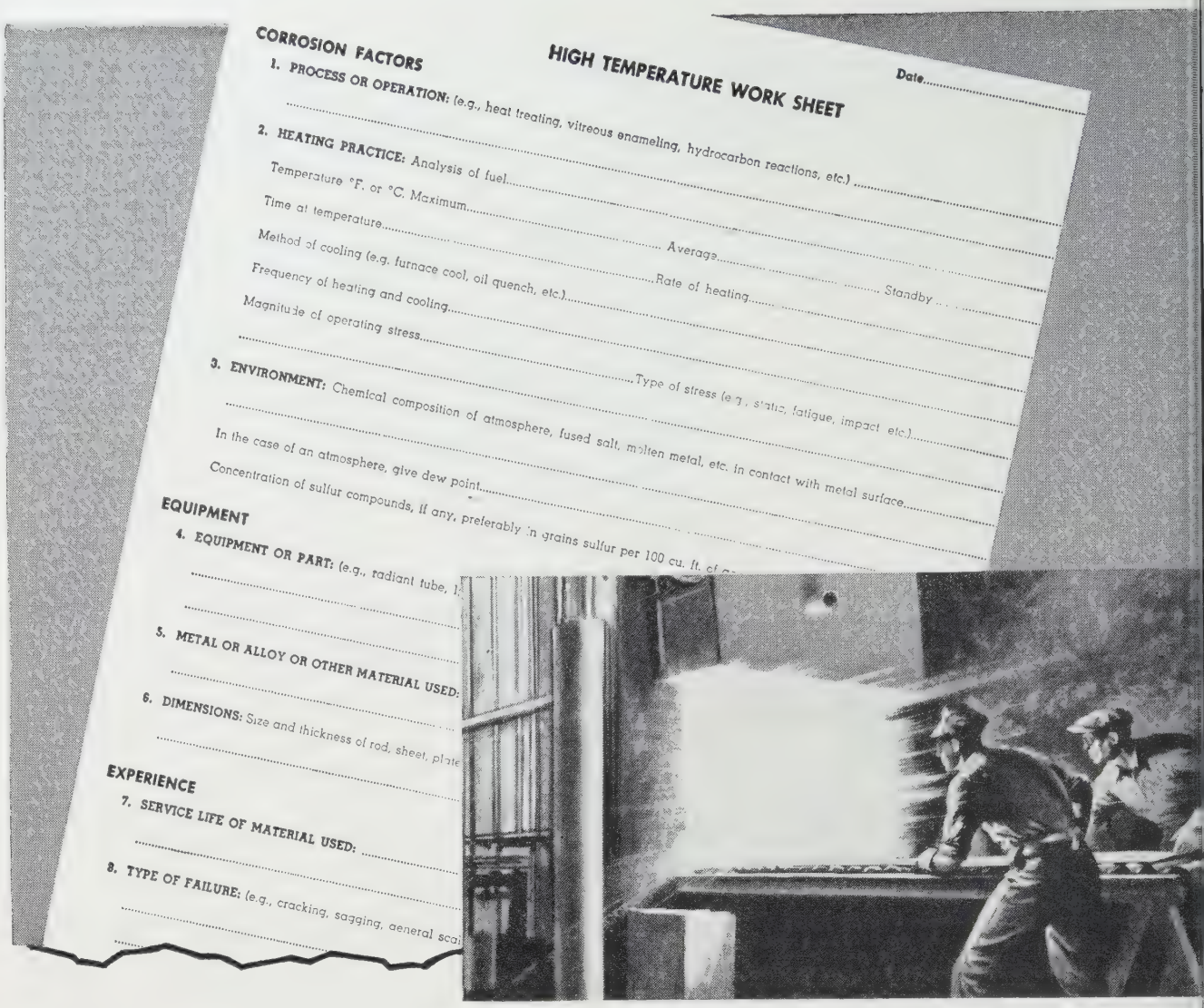
MARVEL *Metal Cutting* SAWS



When you need suggestions on a specific high temperature problem...

The High Temperature Work Sheet has been designed to make it easy for you to outline your problem as completely as possible and to make sure no significant factors will be overlooked. The completed form will assure your receiving information most applicable to your particular requirements.

Use this Work Sheet as a convenience in stating your problem in the event that you:

1 Are undertaking a new process involving the possibilities of corrosion at temperatures with which you have not had operating experience.

2 Wish to compare the performance to be expected from other metals and alloys with that of materials previously used and found satisfactory.

3 Require a substitute for an alloy or material present not readily available.

Fill in and return this coupon.

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Please send me the High Temperature Work Sheet so that I may outline my problem to you.

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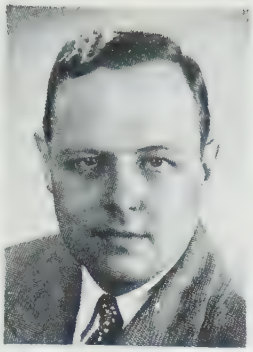

This World of Metals

Like the unstoppable flow of lava from a bubbling volcano, evolutionary changes are taking place in this world of metals. Industries, the men who run them and their products can't escape this dynamic onrush of progress.

Not too long ago, steel was accepted on the basis of general chemical analysis, hardness, tensile or bend tests and visual surface inspection. Specifications now call for closely controlled chemistry and grain size, guaranteed hardenability and machinability, specified impact properties, surface and internal inspection.

The expanding aluminum industry has issued new standards and introduced new grades, including some that provide high strength without heat treatment. In copper, zinc, aluminum, magnesium and other nonferrous metals, the story is the same—better materials to do a better job. New metals like titanium are pushing to get a share of the market.

Complementing the evolution in metals is the endless array of new and improved processes—vacuum metallurgy, precision heat treatment, hot and cold forming, extrusion, faster machining, casting to close tolerances and metal powders formed into a host of intricate parts.

What do these exciting changes mean to you and your company?

Certainly, they will help you in your day-to-day drive to make your products smaller, lighter and stronger. With attention focused on better strength-weight ratios, there's little latitude for unnecessary safety factors. Where the factor was four or five some years ago, it now is little more than one.

Even bigger areas of opportunity should not be overlooked. These changes can be so subtle that they often go unnoticed until they make their appearance in a competitor's product or process.

For management there's no job more important than keeping alert to evolutionary trends and their influence on product design. The two are inseparable from sales and profits.

Irwin H. Such

EDITOR

Why you can get quick action on steel-making questions at Inland

When your steel problem needs a prompt answer, you can get it at Inland where all the men who make decisions are quickly available. Like the top men in sales, steel manufacturing, quality control, raw materials and traffic pictured here.

INLAND STEEL COMPANY
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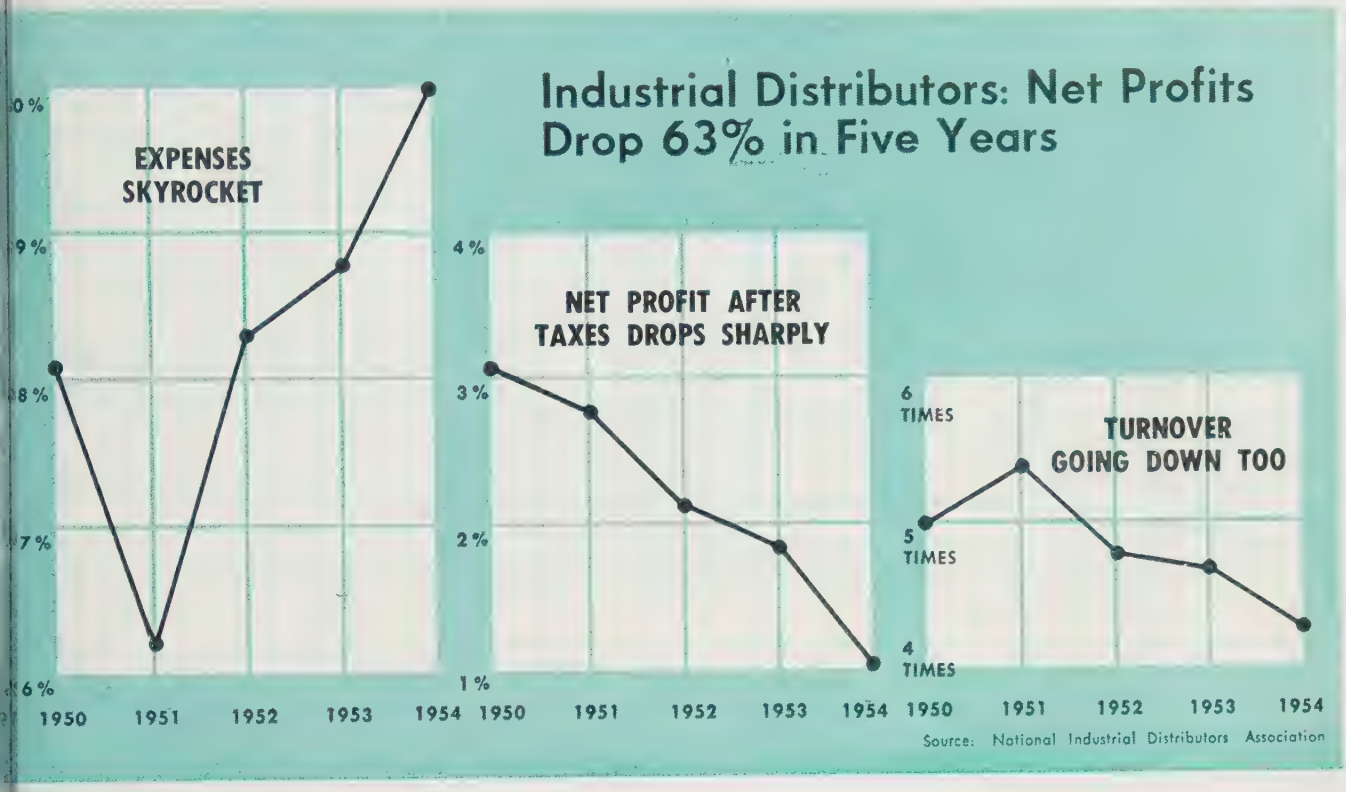
Sales Offices: Chicago • Milwaukee • St. Paul Davenport • St. Louis • Kansas City • Indianapolis Detroit • New York

Principal Products: Sheets • Strip • Structural Shapes • Plates • Bars • Tin Mill Products • Rails and Track Accessories • Coal Chemicals



Profitless Prosperity

Despite high volume, mill suppliers are worried. The above charts show why. Their problems affect metalworking because so many firms buy from and/or sell through them

SALES WILL SOAR 20 to 30 per cent this year in the mill supply industry, but you'll hear no cheers from suppliers. Continued price weaknesses in some areas, slower mill deliveries and lower profits hurt the distributor. In several regions, sales are falling well below the national average due to slowness in the predominant industries.

The new order index of the American Supply & Machinery Manufacturers' Association Inc. for the first seven months of this year ranges from 18 to 47 per cent above comparable 1954 months and surpasses every year except 1951 during those months. A seasonal decline of 13 per cent last July didn't mar bright prospects for a near-record year.

Bad News—That's the bright side of the coin. "Unfortunately, trends show that distributors' net profits dropped by 63 per cent between 1950 and 1954," reports the National Industrial Distributors' Association, Philadelphia. Gross margin and turnover dropped during those years while expenses rose steadily.

The price of mill supplies went up 5 to 10 per cent this year. In most cases increases were passed along to the customer, but there are scattered price weaknesses. "The short-inventory man cuts prices to stay in business. His competition has weakened the prices of valves and fittings," reports a Pittsburgh distributor.

Cutting Profits — "Prices on most mill supply items advanced about 8 per cent this year and should have gone higher. But for the keen competition among distributors, they would have," reports a Philadelphia supplier. Some distributors criticize manufacturers for permitting the marginal low-inventory house to handle their products. "That promotes price cutting," they say.

Lengthening mill deliveries are further hampering the distributor. Plumbing fixtures, pipe, copper products, bronze valves and some types of fasteners are in short supply.

East—The sales outlook varies across the country, depending on the status of principal industries. Eastern distributors say cutbacks in government work have caused 30 per cent declines in sales to some customers. Philadelphia suppliers say shipyard business is at low ebb, with prospects good for a pickup next year. Railroad purchasing remains low, and requirements from gear and tool and die manufacturers are only fair. Among the more active items are drills, grinding wheels, fasteners and hacksaws.

Pittsburgh — Mill suppliers report sales have increased 20 to 25 per cent from 1954 levels. Cutting tools are wearing out quickly under present production rates. Expansion of research laboratories in this area is boosting de-

mand for light machinery, too. Railroad buying is only fair, but the purchase of mine machinery is growing, together with greater demand for coal. Tool and die sales are generally improving. Steel mills, which postponed purchases during 1954 and early 1955, are buying equipment which they only dreamed about last year.

Detroit—In the Midwest, the automotive activity is credited with boosting the business of industrial distributors well above year-ago levels. "The outlook for the balance of 1955 is favorable. It should be a good year," agrees Philip C. Satterthwaite, vice president, Cogsdill Twist Drill Co., Detroit.

Chicago—Small tools, drills and files are in greatest demand, with only a few slow-moving products reported. Price weakness has ended, as 1955 sales advance 10 to 20 per cent. "All lines are moving well, and this indicates a healthy outlook," adds C. H. Paulsen, vice president, B. R. Paulsen & Co. Inc., Chicago.

Southeast—Distributors in this area report net profits are "alarmingly low," but they are optimistic about sales. "We find a cheerful attitude among our consumers of industrial supplies, machinery and equipment," reports Paul J. Stine, president, Harry P. Leu Inc., Orlando, Fla.

West—Aircraft orders are contributing to generally high sales. Prices are stabilizing. Pacific region industrial supply sales were 20 per cent higher in the first seven months of 1955 than in the corresponding months of 1954, western distributors report. "We are confident that sales of industrial supplies during the fourth quarter of 1955 will equal or exceed those for the previous quarters of the year," says C. E. Gollwitzer, manager, Pratt-Gilbert Hardware Co., Phoenix, Ariz.

Hard Selling — The large-city distributor, faced with an increasingly competitive situation, is bolstering his sales force. "We are adding specialists who can pinpoint our sales to specific industries," explains T. H. Hubbard, vice president and sales manager, Harris Pump & Supply Co., Pittsburgh.

With additional Ravenswood facilities, Kaiser is . . .

Expanding the Expansion

KAISER ALUMINUM & Chemical Corp., Oakland, Calif., will start a $90-million expansion program when it completes financing details.

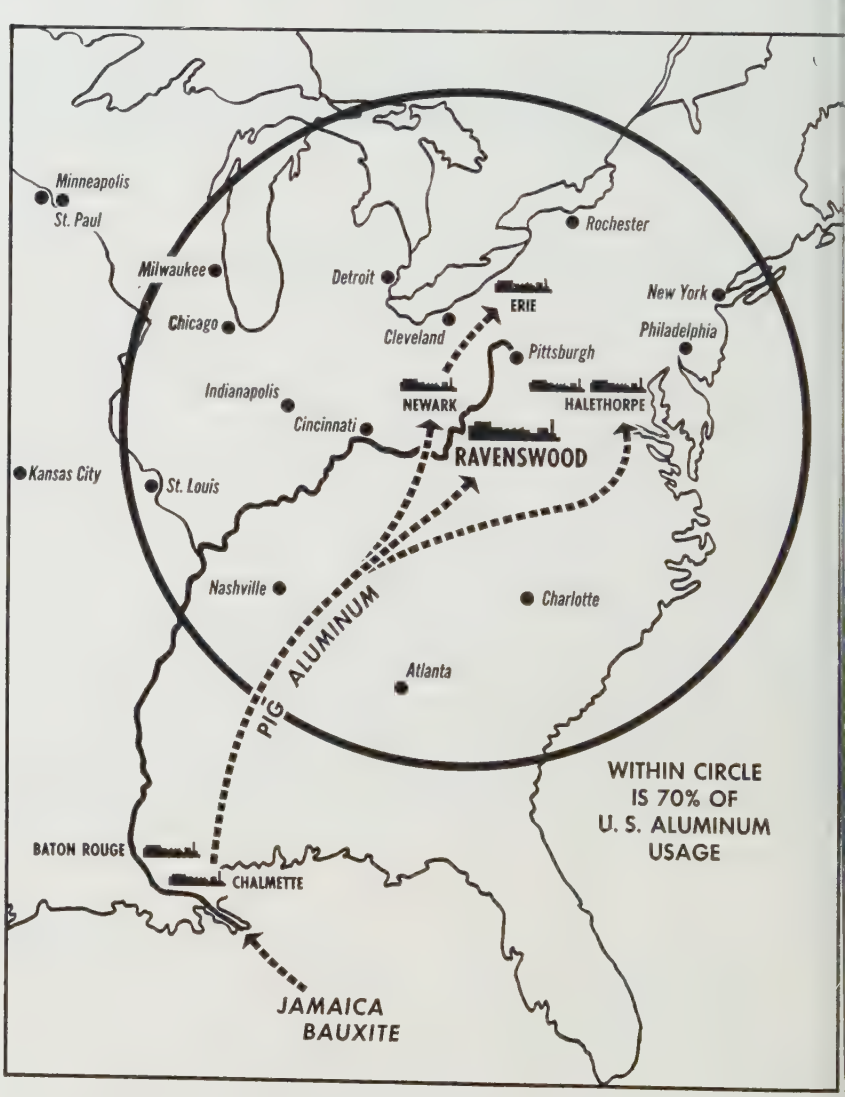
Major emphasis centers on the Ravenswood, W. Va., plant where $75 million will be spent to enlarge and complete a fully integrated sheet and foil rolling mill by early 1957. Annual capacity: 33.5 million lb.

D. A. Rhoades, Kaiser Aluminum's vice president and general manager, emphasized that the program is separate from the corporation's recently considered plans to expand bauxite, alumina and primary aluminum reduction capacity.

Market Growth — "The decisi to expand Ravenswood faster on a larger scale is based on increasing demand for alumin sheet and foil products," Rhoades said.

Strategic Location—"Centrali within a 500-mile radius of m than 70 per cent of the natio aluminum usage," Mr. Rhoa pointed out. "Ravenswood will able Kaiser to strengthen its se ice position.

"It will also consolidate the co pany's direct line raw material sembly flow in its ore-to-mar operations. Some 5000 miles current freight haul will be eli



Kaiser Aluminum's Ravenswood, W. Va., rolling mill is on a 2500-acre site on the Ohio river. It is within 48-hour truck or rail shipping distance from most major aluminum users. Raw material flow: Jamaica bauxite mines to the Baton Rouge, La., alumina plant; from there to the Chalmette, La., reduction plant; then up to Ravenswood

nated. Freight costs on this will e reduced 69 per cent."

Equipment Orders—United Engineering & Foundry Co., Pittsburgh, is building a 168-in., hot reversing mill and a 100-in., 5-stand, 4-high, continuous hot mill for the Ravenswood plant.

Lewis Foundry Division of Blaw-Knox Co., Pittsburgh, has a contract calling for two 4-high cold mills, a 72-in., 2-stand tandem mill and a single stand mill.

Loewy-Hydropress Inc., New York, is building a 110-in., hot reversing mill. Total orders: Over $21 million.

Also to be installed is a 72-in. wide foil mill. Direct chill casting facilities will produce rolling ingots up to 10,000 lb, largest ever used in the aluminum industry.

Other Plant Expansion — Increase in annual capacity of the Talethorpe, Md., extrusion plant from 24 to 46 million lb; increase of 12.6 million lb of primary aluminum capacity at Mead and Tacoma (Wash.) reduction plants; installation of a cryolite recovery plant for direct chill casting of billets at the Chalmette, La., plant.

Financing—Public sale of a new series of 4¾-per cent preferred stock will bring in about $35 million of the expansion funds. The rest will come through the sale of $40 million of 3¾-per cent first mortgage bonds and rescheduling of payments on present bank loans.

U.S. Steel Offers Plastic Pipe

National Tube Division, U. S. Steel Corp., has introduced its second type of plastic pipe. Made of polyvinyl chloride, it is known as PVC. The division came out with polyethylene pipe earlier this year.

H. J. Wallace, vice president-sales at National Tube, says the new pipe is excellent for sour crude oil pipe lines, salt water disposal lines, chemical plant piping, industrial cold water lines and vent pipes. PVC resists attack by acids, alkalies, salt solutions, alcohols and most chemicals.

The new product is being handled by steel pipe distributors throughout the country. Sizes range from ½ to 6 in. Light weight makes installation easy.

Loading leaf springs at Maremont Mfg. Corp., Bayamon, P. R.

Opportunity in Puerto Rico

LOOKING FOR a Shangri-La plant site where there are no taxes and abundant labor?

Maremont Automotive Products Inc., Chicago, found it when the company located a leaf spring plant in Puerto Rico. The venture was so successful that it's now building a second 11,000-sq ft factory for rebuilding and reconstructing automotive clutch assemblies.

Why Puerto Rico?—Maremont Mfg. Corp., according to its president, J. Theodore Wolfson, was set up in 1953 at Bayamon (a San Juan suburb) "to take advantage of Puerto Rico's unique tax and labor situation."

"Location was another big answer," says Mr. Wolfson. "The island is a perfect center from which to serve Maremont's more than 300 customers scattered throughout 67 countries in South America, Europe, Africa and Asia."

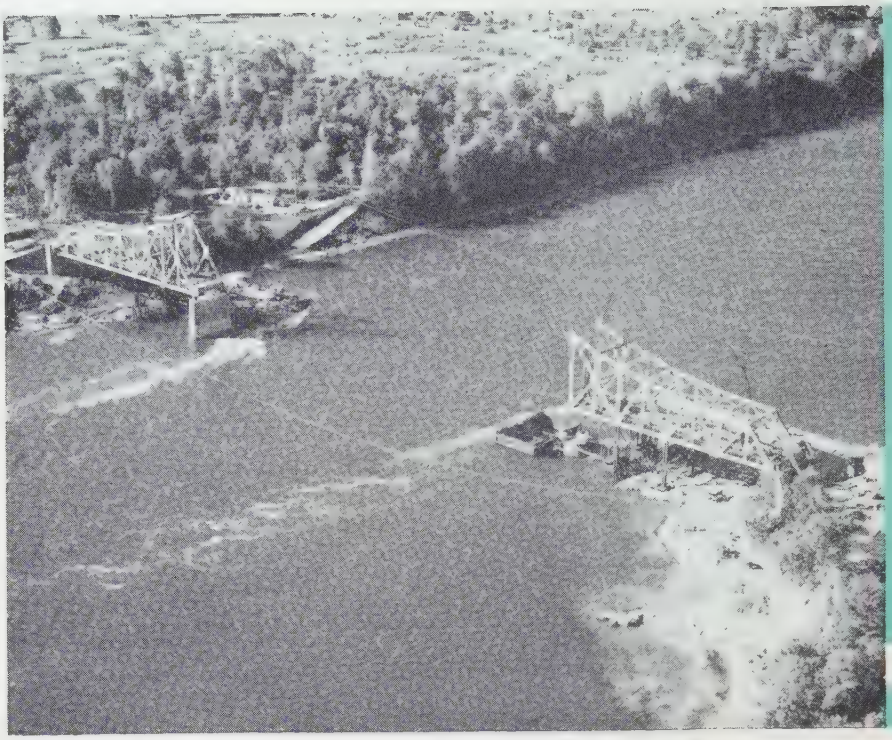
Other Advantages—As a U. S. territory, Puerto Rico has no immigration, tariff or exchange barriers. Because the island has no Congressional vote, federal taxes do not apply.

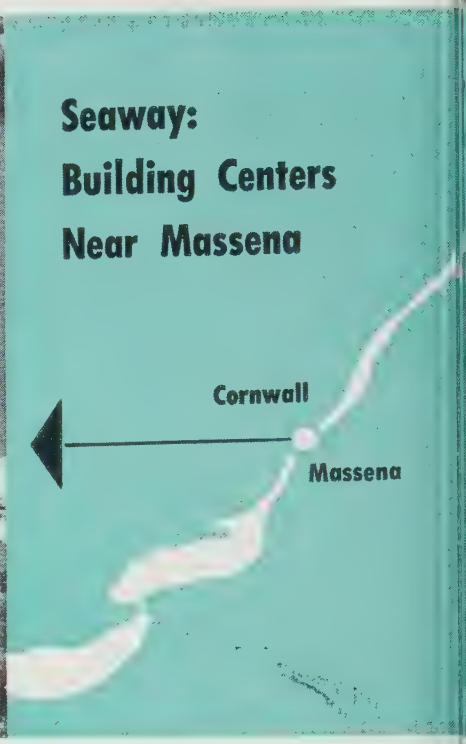
In addition, Maremont and other mainland affiliates get a 100 per cent local tax exemption for ten years under the Industrial Incentives Act of 1954. Taxation and labor advantages outweigh the usually increased transportation costs to and from the mainland.

Labor—"Puerto Ricans," says Mr. Wolfson, "possess an unusually high degree of manual dexterity, but they need careful training to shift to factory manufacture."

Two methods were used: Workers and technicians were sent to Maremont's U. S. plants for on-the-job training, largely at the Puerto Rican government's expense. Others got special courses through the University of Puerto Rico's vocational work program.

Opportunity—In the last two years, some 29 mainland-affiliated metal product plants have followed Maremont's lead. Newest and biggest is Gulf Steel & Wire Co., affiliate of Fanner Mfg. Co., Cleveland. Its 135,000-sq ft mill was built by Puerto Rico Industrial Development Co., a government agency which constructs and leases one-story factory buildings for as low as 40 cents a square foot.





Bridge steel for the power house access road goes up as . . .

St. Lawrence Seaway Takes Shape

BY 1960, the United States and Canada will have run up a combined bill of more than $900 million for the St. Lawrence Seaway and power project. More than $700 million of this is being poured into a 15-mile stretch of the St. Lawrence river just north of Massena, N. Y., where the Barnhart island power plant is going up.

Work on the $600-million power project started in August, 1954. The Boston engineering firm in charge of the American end reports that 93 contracts worth about $114 million have been let. Similar progress is being made by the Canadians. Altogether, some 4400 men are at work. In 1957, when construction will peak, there will be more than 11,000. The power station will be completed by 1959.

Pleasant Surprise—Bidding has been keenly competitive. Many jobs, says one official, have been let well below estimated figures. Adds the New York Department of Commerce: "Employment is less than originally anticipated, largely because of the extensive use of heavy equipment." Some $35 million in construction machinery already is working.

The seaway itself is not scheduled for completion before 1960. It was April before ground was broken on the American portion. Six prime contracts have been let, including all excavation work in the Massena area. The 10-mile-long Sault canal and its two locks are about 15 per cent dug out. Bids for the locks will be opened early next year. They will be ready for 27-ft shipping by the spring of 1959.

Lion's Share—The initial cost of the seaway will be $300 million, of which Canada will spend about $195 million on deepening the Welland canal and building five new locks. Between them, the U. S. and Canada have some 1500 men working on this end of the project. In the peak construction year, there will be about 5000.

By 1959, the project will start to repay some of its cost. The power plant will be the second largest in the world (Grand Coulee dam rates first). Its theoretical capacity is almost 1.9 million kw. It will have a steady output of 1.4 million kw. The new waterways will handle ore carriers of 25,000 tons capacity, ten times the present limit. Between 1965 and 1970, shipments through the seaway are expected to jump to 52 million tons a year, five times as much as was cleared in 1953.

And 1960 won't see the end of development in the St. Lawrence region. The initial cost of the seaway itself may mount into billions, as connecting harbors, channels and port facilities are built and dredged and new industry comes in.

More Start Apprenticeship

The number of apprentices rose 4015 during the first six months of this year. The Department of Labor says 162,690 apprentices were in training at mid-year.

Biggest increases were in the construction industry, says W. F. Patterson, director of the Bureau of Apprenticeship.

Booming auto production calls the signals as . . .

Diecasters Eye Record Year

TALK ABOUT growth industries: Diecasting sales this year will hit about $415 million, almost 30 per cent more than the previous best year, 1953. To rack up those billings, the 400-odd independent diecasters will melt 375,000 tons of zinc and 390 million lb of aluminum.

The spectacular gain is all the more impressive in view of the close dive sales took during the 1954 slump (see chart).

Buyers—Largest user of job shop diecastings is the auto industry, supplementing big volume by captive affiliates. Next are home appliances, machinery and tools.

Armed with improved die materials and melting practices, broader use of metals and "lower your costs" ammunition, diecasters are making steady progress in establishing new applications for their products. They include diversified uses like: Typewriter frames, street light reflectors, new aircraft and automobile air conditioner components, lawnmower frames, electronic parts and builders' hardware.

Application—The aluminum one-piece stator used in automobile torque converters is a good example of cost cutting. Before the piece was designed to be mass produced by diecasting, each blade had to be individually machined and assembled to the hub by hand, too costly a process for lower-priced car installation.

The early bugaboo of size limitations no longer holds. The auto industry is diecasting grilles and door frames; experiments are progressing with equipment for diecasting engine blocks. The goal: To take advantage of diecasting's low per-piece labor cost.

Future—Since 1946 the use of zinc diecastings has increased an average of 8.8 per cent a year, despite the dip in 1954. Aluminum, since 1948, boasts an average annual growth of 28 per cent. Confident that those gains will continue, the American Die Casting Institute estimates that by 1960 requirements will be a minimum of 500,000 tons of zinc and 800 million lb of aluminum. Gains are also seen for magnesium, copper-base alloys and other higher melting point materials, owing to improvement in die metal and die lubricants.

Automotive outturn could fall off moderately in 1956 and still require more diecastings; more are being used per car. The increase would favor the light metal. Zinc diecastings are tied more closely to production (grilles, door handles, etc.), while use of aluminum is broadening from year to year.

Headaches—Despite growing acceptance of their product, diecasters have their troubles. Aluminum supply is one, with secondary smelter tonnage accounting for close to 85 per cent of requirements. Aluminum has not eased since diecasters asked for relief from the government's stockpile earlier this year. A halt in stockpiling for at least one quarter and restrictions on the export of aluminum scrap would help supply, at least temporarily, in the opinion of most diecasters.

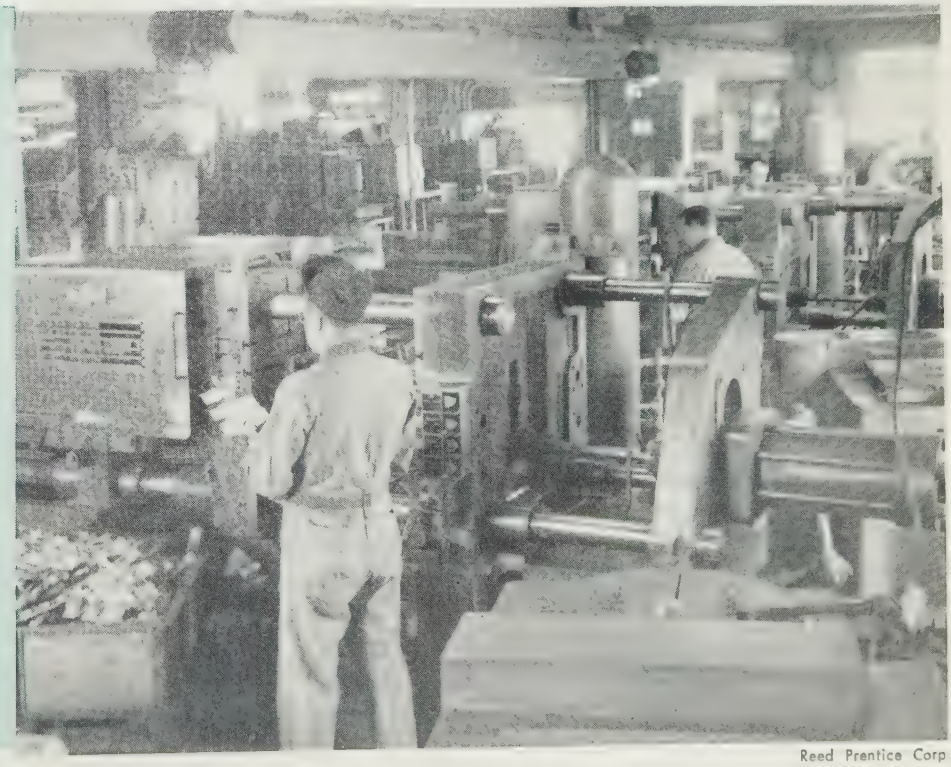
Enough zinc is in sight, but fluctuating prices command strict attention in estimating diecasting costs for forward delivery. Consideration is being given to price estimates based on the average special-high-grade zinc cost in the previous quarter.

Diecasting Sales

(millions of dollars)

1955	$415
1954	270
1953	325*

*Previous high year



Reed Prentice Corp

Worker puts a polish on a large casting inside a special room

Shotblasting Sales Shine

SHOTBLASTING equipment is going great guns this year. "Industry sales are running 75 per cent ahead of 1954 and 35 per cent ahead of 1953." That's how E. A. Rich, general sales manager of Wheelabrator Corp., Mishawaka, Ind., paints the picture.

Wheelabrator and Pangborn Corp., Hagerstown, Md., have the lion's share of the business. About a dozen makers are in the field.

Trend—The leaders are promoting the enclosed cabinet machine. Work is mounted in a fixture and continuous loading arrangements can be provided. Most machines depend on centrifugal force to hurl shot from a rotating wheel, though air blast units are made.

The other major type of shotblasting equipment (see photo) is still going well. Says D. E. Neustadt, sales manager of W. W. Sly Mfg. Co., Cleveland: "This equipment has the advantage of complete flexibility. You can blast work as big as the room."

New Look — The main function of shotblasting is to clean or deburr parts. But increasing interest is being shown in shot peening, where cleaning is secondary to improving the physical properties of the work. Automobile springs have been shot peened for quite some time. The aircraft industry (see STEEL, May 23, p. 102) is adopting it.

Vacu-Blast Co., Belmont, Calif., notes: "The Navy now specifies shot peening for ship propulsion gears." Vacu-Blast's sales volume runs about $1.5 million a year. It will be up 50 per cent this year over 1954. The company hopes to make a similar gain next year.

Design Problem—Other make share this optimism. One of t oddities of the shotblasting bu ness has been the design proble presented by a machine that co sumes itself. It has been lick by hard-wearing alloys in the m chines and the development cast steel shot as the abrasiv

All makers rely on a doubl edged sales spur: Savings in l bor and cleaning costs. They ci labor savings as high as 400 p cent, the trimming of cleanir costs to one-fifth of what th were.

ODM Sets Goals

Expansion for defense goes o but rules for fast write off taxes are tightened up

ARTHUR S. FLEMMING, direct of defense mobilization, has act on the 38 industry expansion goa that were suspended Aug. 1 He reopened 11, closed 26. On taconite remains on the suspend list.

The goals set the top limit f which the government will allo industry fast tax write-offs. C the reopened goals, ten were r vised. Here are some of the ne ones:

Commercial aircraft—900 plan —orders must be placed by th end of the year.

Domestic petroleum—A refinin capacity of 9 million barrels a da by Jan. 1, 1957.

Rutile expansion — 35,000 ton due Dec. 31, 1955.

Manganese ore—Target date ha been extended to the end of th year.

The freight car goal will cove cars for which construction i started, or orders placed, by Dec 31, 1955.

Closed Goals — Among the 2 closed goals are: Antimony, baux ite, cobalt, by-product coke, syn thetic cryolite, electrolytic ti plate, large gray iron castings iron ore, diesel locomotives, o pipe lines and storage facilities ore carriers, railroad passenge cars and titanium. The closin of aluminum and most steel goal was reported in STEEL, Oct. 3, p. 41

Chas. Wm. Doepke Mfg. Co.

$1-billion retail sales year in '54 set the pace as . . .

oymakers Go for Another Record Year

AGINATION, alertness to mer-ndising procedures and contin-g growth in population will ng another banner year to the industry.

ales last year passed the $1 ion mark (retail level) for the t time. Prediction for this year: ok for them to rise another 10 cent. Manufacturers' total es were over $500 million in and should rise to $550 million s year.

Metal Statistics—Manufacturers' es of metal toys will rise to ne $230 million this year which pares with $210 million in 4 and $180 million in 1953. Into se metal toys, explain industry kesmen, go some 225,000 tons steel—mostly light gage sheets, p and spring wire. More alu-num will be used this year, too, applications will be small when pared with the amount of steel d.

Toy producers are reaching their annual production peak as 70 to 75 per cent of all the toys manufactured in the U. S. are sold at Christmas time. Peak sales period for manufacturers is in March —the time of the annual trade show sponsored by Toy Manufacturers of USA Inc.

Who Buys?—A survey conducted for the toy industry by Opinion Research Corp. indicates that 33 million families spent an average of $28 for toys during the 1954 Christmas season. On this basis, the survey's suggestion that the toy business last year may have approached $1.25 billion (at retail level) seems within reason.

Major market: Toys for the two to six year olders. Half the toys purchased and half the dollars spent are in this group. About a quarter of the toys (and a quarter of the retail dollars spent) are in the seven-to-ten-year age bracket. Older children (11 to 14) account for only 9 per cent of the toys sold and 13 per cent of the retail dollars.

While the toy business has expanded, the number of manufacturers has remained about constant. Out of 2000 producers, 1200 get 95 to 98 per cent of the industry's business.

Imports Grow—With the duty on toys from Japan reduced 50 per cent since Sept. 10, imports will increase over last year's total of $15.8 million (including $2.9 million in metal toys). Totals for the first seven months of this year already are ahead of the corresponding period for '54 by some $1.9 million. Japan and West Germany continue to be the leading toy exporters to America.

If sales continue at present levels, some 2000 toy manufacturers will receive a big Christmas present—another record year.

Small businessmen don't like the fine print as . . .

SBA Loan Program Lags

DISSATISFACTION with the loan policy of the Small Business Administration is causing more and more small firms to boycott the organization.

Cause of the Trouble — When a borrower's application is under discussion, he is not told about certain restrictive conditions he must accept before he gets the money.

Informed parties say that about 40 per cent of potential borrowers refuse to accept the conditions, and the deal falls through.

Case History — One authorization a proposed borrower could not stomach contained 23 stipulations which were inserted by regional office attorneys.

On appeal to SBA lawyers in Washington, 16 of the 23 stipulations were deleted, but the remaining seven were so objectionable that the borrower declined to accept the money.

The Fast Break—One of the most objectionable SBA stipulations is not sprung on borrowers until their loan applications have been approved. It is called the "After-Acquired Property Agreement." This clause binds a borrower to add to the collateral, which he put up, all property and assets he later acquires.

"Disbursement of the Loan" is another amazing clause which forces a borrower to get regional SBA permission before he can use any of his loan money—no matter how well secured by collateral.

Other stipulations call for the signature of the borrower's wife, freezing of officers' salaries during life of the loan, etc.

No Good Reason — There also have been nasty instances where small business loan applications have been turned down without adequate reason.

The transcript of testimony taken in March, 1955, by the Multer subcommittee of the House Small Business Committee cited the turndown of the Triest Mfg. Works, Annapolis, Md.

Organized to produce a new pipe wrench called Stilsomatic, Triest's $65,000 loan application was turned down three times by the SBA despite the fact that Farmers National Bank of Annapolis agreed to participate to the extent of 35 per cent. Triest had assigned government contracts wo $543,579 as collateral.

Signs of the Times—Meanwh it looks like SBA is in for s sort of investigation in the r future.

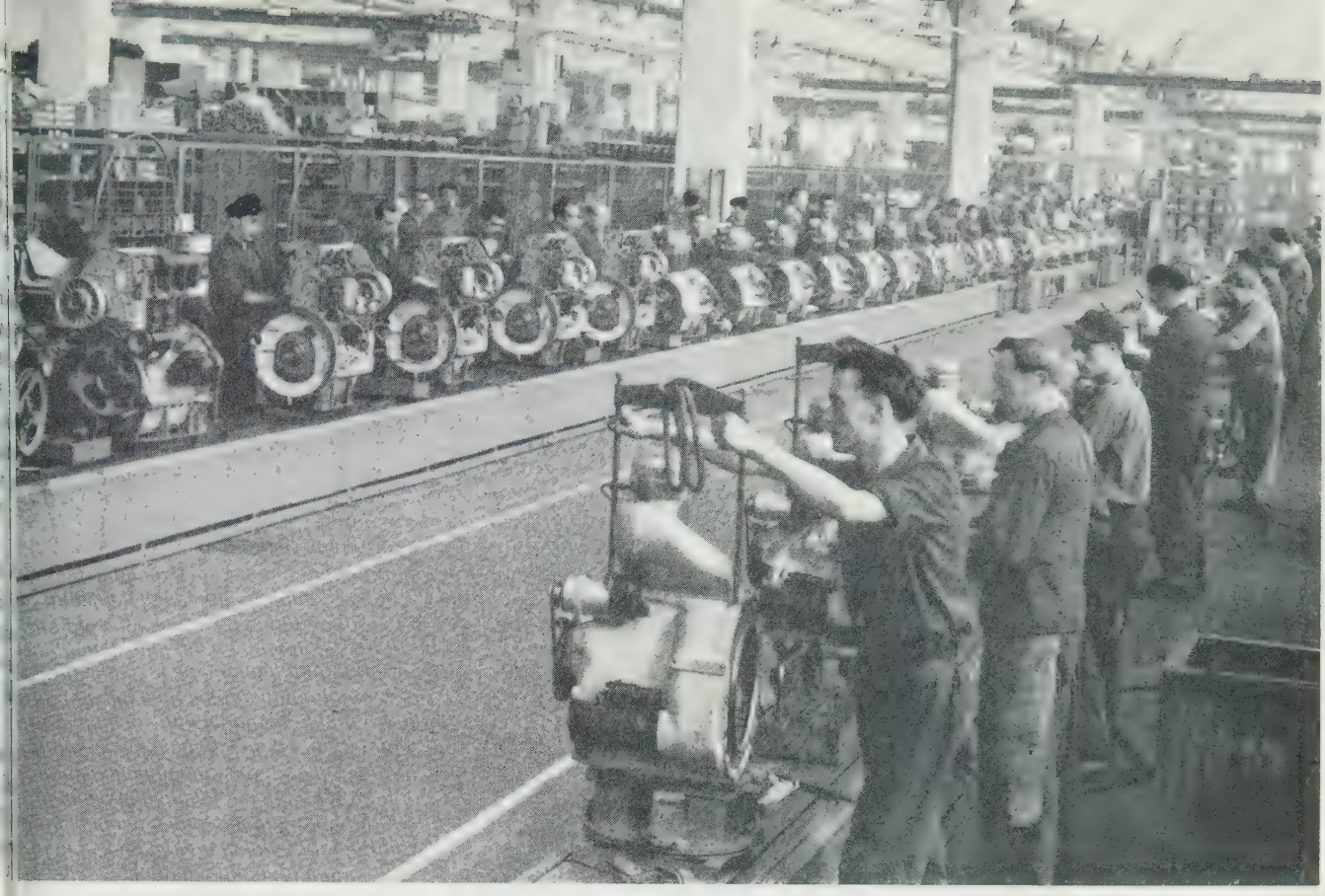
Wright Patman, chairman, Ho Small Business Committee, ma no bones about his dissatisfac with the way SBA functions. a recent report, Mr. Patman s "SBA has received loan inqui from small businessmen at an erage of better than 11,000 month.

"In its entire 21 months of eration, however, just 5085 these inquiries successfully pas SBA's screening tests and bec formal loan applications. Of th few, SBA approved 1141.

"Only 395 of these approved plications were for direct lo which involve no bank partic tion. SBA actually made disbu ments to 276 of these."

Meet C. F. Ogden: He's the assistant director, materials, fice of Defense Mobilization.

Mr. Ogden is on leave from Detroit Edison Co., where h manager of purchases. He advise ODM Director Arthur Flemming on the quantity of terials required to meet the tion's defense and stockpile ne materials expansion and proc ment programs for mobiliza He may be contacted in Wash ton by calling Sterling 3-5 Ext. 3313.



Klockner-Humboldt-Deutz assembles air-cooled diesel engines with 1 to 12 cylinders from standardized parts at its Cologne plant

'est German industry makes plans for becoming . . .

Workshop of the World

ERMANY has always been e workshop of Europe; now it ould become the workshop of e world."

That statement by a prominent rman pretty much reflects the nomic planning and objectives the Federal Republic today.

Out for Business — German in- stry is establishing sales agen- s and branch plants around the rld, including areas previously minated by Great Britain and e U. S. Plenty of opportunity o is seen for more business in e U. S. for such items as toys, entific instruments, cutlery and tos. Where German firms can't npete for direct sales, they're ting up licensing arrangements. yet, the Germans are not going out to combat American mass oduction methods and high ges. They're competing where e labor content of an individual- ly produced item is high.

Federal Minister of Economics Ludwig Erhard is fighting for freer world trade and convertibility of currencies—all part of the conviction that Germany cannot live alone. More business abroad means more for the people at home. Two years ago only one of 55 Germans had a car. Now there's one for every 34.

More Consumer Goods — Four hundred television sets were made in 1951. Last year, production was up to 200,000, and it's expected to be 3 million in a year or two. Radio production already is up to 3 million. Production of other consumer durables like refrigerators and washing machines this year is double that for 1954.

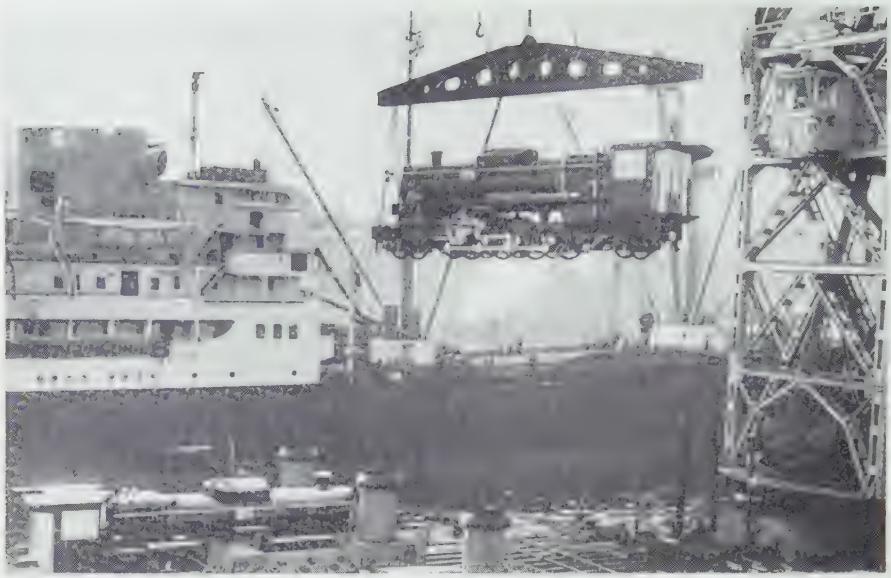
Prices on industrial and consumer goods are tending down currently but are about double 1937 levels. Exceptions are prices on mass-produced items like radios and fractional horsepower motors that are about the same as prewar.

Job Shops—The German "workshop" can be likened to job shops in America. A good example is Machinenfabrik Augsburg - Nurnberg A. G. that engineers and builds a score of products, ranging from small printing presses to conveyors, bridges, diesel engines, gas holders, steam turbines, railroad cars, busses and trucks.

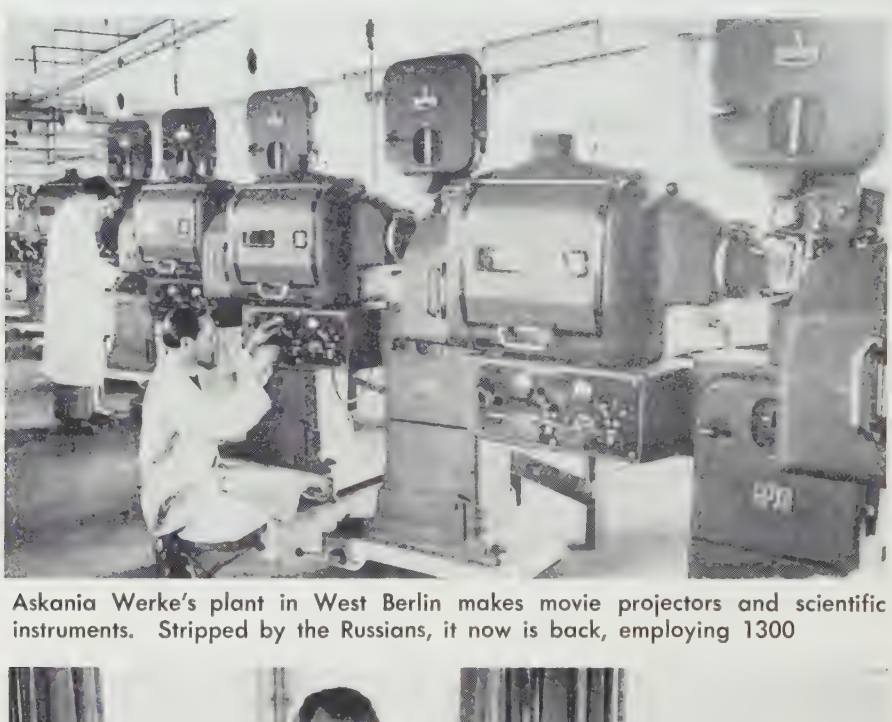
Its Nuremberg plant was 85 per cent destroyed in the war, but bombs missed the building where 40-ton Panther tanks were being assembled, and the last one was delivered two days before the Americans arrived. In that same building, heavy trucks are rolling out at the rate of 350 a month.

A new 42-ton truck (with trailer) has an 8-cylinder "noiseless" engine that burns gasoline, kerosene, gas-oil diesel fuel, jet fuel or even light engine oil. It develops 155 hp at 2000 rpm and has a compression ratio of 17 to 1.

Quietness is attributed to a new direct fuel injection system and



At Hamburg, another locomotive is on the way to a good customer like India or South Africa. Of $60 million locomotitve output, 70 per cent is exported



Askania Werke's plant in West Berlin makes movie projectors and scientific instruments. Stripped by the Russians, it now is back, employing 1300

AEG's Max Nippold (left) and Friedrich Mortzsch (right) tell Editor Irwin Such about sales plans as German Press Chief Paul Weber (standing) looks on

improved piston design. M
plans to license a U. S. comp
The French also are interes

MAN engineers say they h
developed a diesel with the lo
fuel consumption in the wo
Thermal efficiency is 45 per c
versus 38 per cent previously.
new locomotive engine has the
efficiency of 42 per cent.

The latest marine diesel is a
cycle, 16-cylinder, 3500-hp job
veloped for the U. S. Navy. B
win-Lima-Hamilton is the M
licensee. Beginning in 1956, M
will build marine engines
steam turbines at Hamburg.

MAN has offices in New Y
to contact engineering firms
contractors with orders in ot
countries.

Best Customer, India — Bef
the war, Managing Director F
H. von Mitterwallner of Krau
Maffei A. B., Munich, would
elated over an order for 20
25 locomotives. Since the w
orders are much bigger. His c
pany has booked 350 steam lo
motives for India, his best c
tomer, and also has an advis
contract with Indian railroads.

In 1922, the company star
making welded locomotive fra
and now is building them up
4000 hp by this method. K
works with Siemens and A
in building electric locomotiv

For variety, K-M makes pa
mill, plate glass, flour mill a
packing house equipment, and
a jobbing business in iron and st
castings.

Tailor-made Plants — Dr. W
ter F. Vogeno of Glockner-Hu
boldt-Deutz A. G.'s Humboldt D
sion thinks that in setting up
production process, planning, en
neering and construction should
combined in one organization.

Humboldt, for instance,
built a tailor-made electrolytic z
plant in Austria, a cement plant
Evansville, Ind., and an expe
mental low-shaft blast furnace
making pig iron.

Air-cooled Diesels — Franz
Dickel expects the Deutz divisi
will make 45,000 diesel engines t
year (more than any company
the world). He says that figu
compares with 40,000 last year a
General Motors' production
about 36,000.

Using standardized parts and assembly line methods, Deutz builds r-cooled diesels with 1, 2, 3, 4, 5 6 cylinders in line and V-types th 6, 8 and 12 cylinders.

The air-cooled engines are going o Deutz farm tractors, Magirus ucks and industrial equipment. utz engines are running irrigan pumps in the U. S. and are placing some gas engines in ucks.

Deutz developed the air-cooled pe during the war, and Herr ckel expects to license an engine ilder in the U. S.

Lightweight Trains — For 100 ars, Linke-Hoffman-Busch built ilroad cars in Breslau. When the ussians took over, L-H-B moved Salzgitter where its 2600 workis produce eight freight cars a y and 14 passenger cars a month.

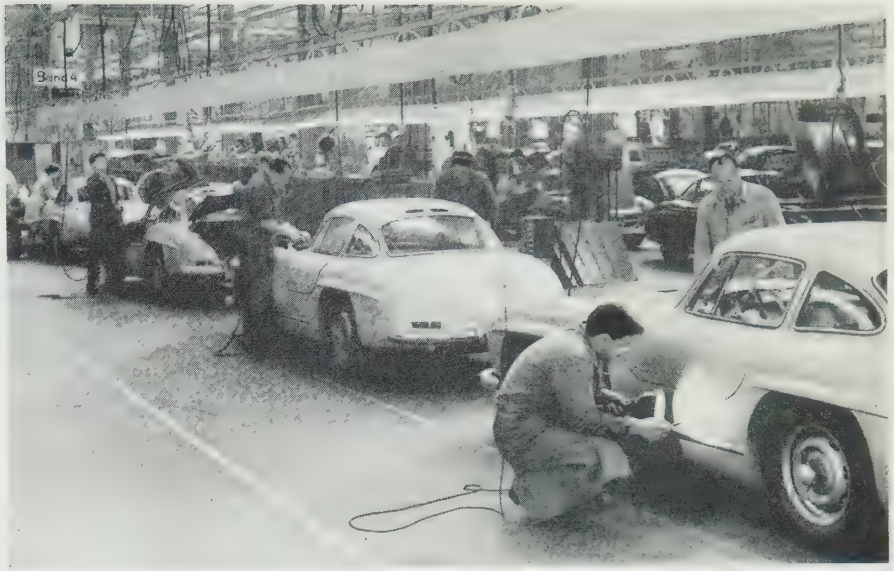
L-H-B hired an aircraft designer rmerly with Focke-Wolf to rece car weight. A seven-unit ticulated train for German railads weighs 100 metric tons and uls 130 passengers with a 600-hp gine. A conventional train with e same capacity weighs 190 tons d needs 1200 hp. The cars have lindrical bodies like an airplane, th longitudinal supporting members welded to the skin.

Weight in American-type cars r Chile has been reduced from tons to 31 tons. For short hauls Germany, light rail-busses are pular.

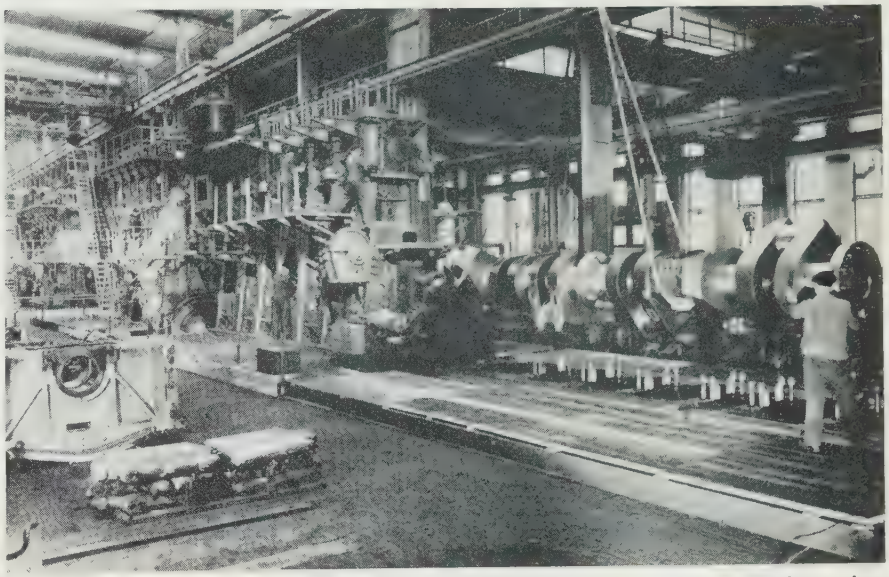
Auto Trends—German engineering advancements in automotive gineering like Daimler-Benz unit dy and frame construction and ee-swinging rear axles for better adability are reported influencg American designs for 1957 and 58.

Economies are seen in direct fuel jection, but U. S. engineers still vor the conventional carburetor.

Pumps — Pleuger Unterwasserimpen, Hamburg, has developed ep-well, squirrel-cage, electricotor-driven pumps for both water d oil in sizes up to 1500 hp. Sixty per cent of Pleuger's proction is exported, with the U. S. e No. 1 market, Australia, the o. 2. Director H. Knirsch says nversations have been held with presentatives of the Byron Jackn Co. for American production ghts.



Daimler-Benz turns out nine sports cars daily at Sindelfingen, Germany. Most of them are headed for America, where the firm plans to set up a plant



Working with Baldwin-Lima-Hamilton, Machinenfabrik Augsburg-Nurnberg has built 3500-hp diesel for U. S. Navy, weighing a sixth as much as usual type

Electrical Equipment — Allgemeine Elektrizitats - Gesellschaft was closely associated with General Electric Co. until World War II, and the two companies still are good friends. AEG makes practically everything from small household appliances to steam turbines for central power stations.

AEG sales this year will be about 750 million DM. Its affiliates, including Telefunken, will do another 750 million.

AEG's chief competitor is Siemens and to a lesser extent Brown-Boveri and Bosch. Exports amount to about 18 per cent of total sales. Austria is proving to be a good market. In South America, AEG is making more headway with its industrial lines than with domestic appliances.

Defense — Most German industrialists agree with Director Karl Weiss of MAN who says: "We want to have as little to do with defense as possible, but we expect that we will have to engage in it."

Report on Europe

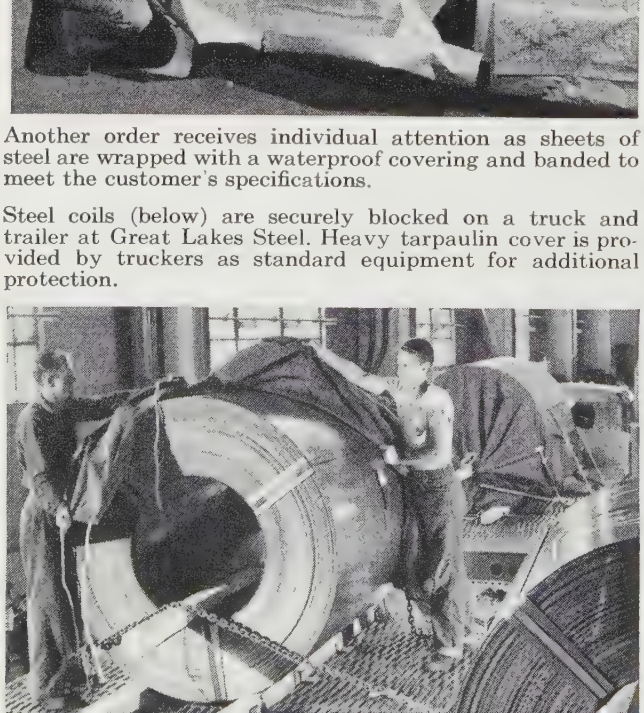
Back from a six-week tour of West Europe, STEEL's editor, Irwin H. Such, reports his findings in this article, the sixth of a series.

This new type of railway car is designed for maximum protection of steel coils. It is being used experimentally by Great Lakes Steel.

How Great Lakes Steel *delivers* quality

Another order receives individual attention as sheets of steel are wrapped with a waterproof covering and banded to meet the customer's specifications.

Steel coils (below) are securely blocked on a truck and trailer at Great Lakes Steel. Heavy tarpaulin cover is provided by truckers as standard equipment for additional protection.



The emphasis on quality at every stage of proc tion at Great Lakes Steel extends right on thro to the Delivery Department. There, careful at tion is given to handling and packaging each and bundle to make sure that the customer rece his order in prime condition.

The Delivery Department has another import responsibility, too. It must see that our prod reach each customer in ample time to meet production schedules.

For quality with service—that extends all the from the beginning of our operations to the of yours—call on Great Lakes for your flat-ro steel requirements.

GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION

District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Ra Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadel Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Tor

Will facelifts, as with these 1956 Dodges, come between . . .

New New Cars Biennially?

AUTOMAKERS used to share the spinster's belief that a new brand of paint on the same old facade adds to product appeal. In part, that was a belief born of necessity. An automaker can't make basic body changes any easier than a spinster can.

New Pattern—But as competition grows ever keener in the industry, a new and exceedingly costly pattern is emerging: Completely new cars every two years, with a major facelift in between. The completely new cars introduced in 1955, for example, will be completely new once again in 1957. And of almost equal importance will be the facelifts in between. The present pacesetter is Chrysler Corp. Its 1956 models include visibly different rear quarter panels, hoods, grilles, bumpers and even rear deck lids on one line.

This trend is interesting. It means upwards of $1 billion dropping into the tooling coffers every two years, and more salable automobiles with an impact that cannot fail to bolster the residual strength of the economy. It also represents a high watermark on a tide that was only a ripple 30 years ago and could become a flood in the future.

Model T—The classic example of lack of model changes is the model T Ford which evolved from 1908 to 1927 in a manner which can only be described as retiringly. Mechanical changes were made, and even some styling modifications were adopted, but it takes a man who knows the breed to pinpoint the year a particular specimen was made (15 million model Ts were produced).

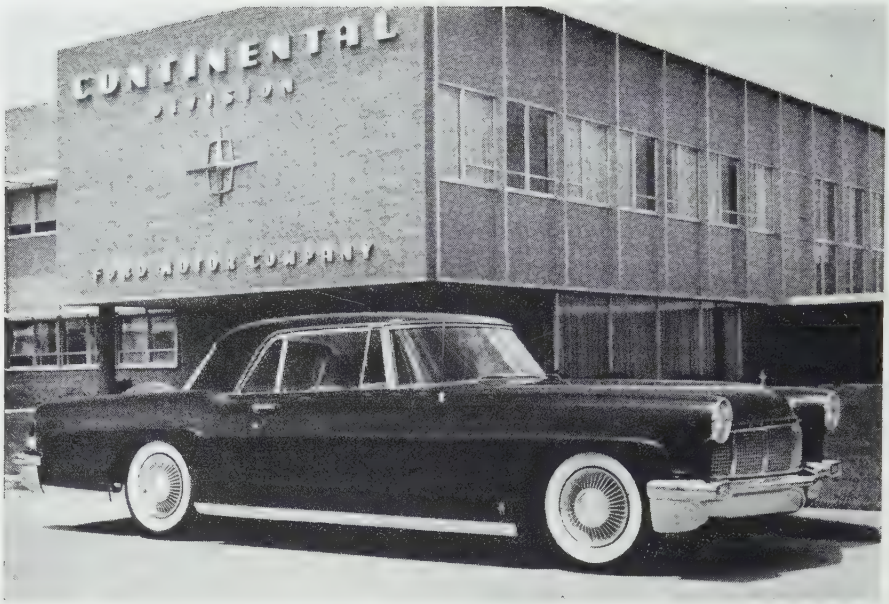
In large measure, the model T was typical of the era. There were no formal facelifts as we know them today. Changes were made when it was established that they were improvements, often without regard to year. For that reason, models did not coincide with years at all, and the model T lived almost 20 years, the model A about four and the model B one.

Evolution — This pattern coincides roughly with the awakening of the industry to the yearly model change.

As competition began to stiffen among the industry survivors in the late 1920s, a nameless hero hit upon the idea that the public had associated changes with improvements; that changes, whether they were improvements or not, might well sell cars.

Subtle Shift—Thus it was that change for the sake of change, emphasizing newness for the sake of newness, entered the auto industry. People who previously bragged of the reliability of their cars and how many miles they had served without trouble now began to talk of "mine is a '33." Perhaps the change was inevitable, for reliability had moved from the realm of the uncommon to the accepted.

In those days the cost of a "facelift" was numbered in the thousands of dollars. But as the scope of facelifts began to increase, the bill began to mount. The trend has culminated this year in what is perhaps the most costly facelift in the industry's history, the $175-million job of Chrysler Corp. The postwar pattern of three years for a basic body shell and major sheet metal now promises to be reduced to two years.



Ford's Continental Mark II is more than 18 ft long, but its over-all height is only 4 ft 8 in. Its Dearborn, Mich., plant is designed for low volume, high quality

with changes more significant than ever before in between.

New Era — The impact of this new policy could come close to doubling the cost of each new model introduced year by year. Tool engineers and stylists more than ever are being called upon to work hand in hand to anticipate styling changes and provide for them in the original tooling. Entering the picture: Dies with removable inserts which can be changed to avoid replacing the entire die; jigs and fixtures which can be adjusted or otherwise altered to accommodate new sheet metal; and materials handling devices with clearance for next year's parts.

How much unit tooling cost goes up—or if it goes up at all—is dependent upon how well these men do their work and how well the result sells.

Bigger Gamble—Looking down the road, it's obvious that the gamble on a given model increases as the tooling investment goes up. A bad sales year or two for a firm with marginal capital could spell the beginning of the end. The same could be true of auto suppliers whose changes must be as radical as those of the automakers themselves in many cases—often coming yearly rather than on a two-year basis.

Can completely new lines be introduced every year? One auto company spokesman figures that such a move is at least a long way in the future for two reasons.

First, the time required to design an automobile and tool it is presently about 20 months. That would mean the car ahead would have to be styled without any yardstick of public acceptance, which would increase the chances of a complete market miss.

Second, there is considerable doubt if present tooling capa could handle the sheer volume that much retooling every year

Plastic Tools? — As the a makers go ahead with their m to new cars every second y and major changes in between possibility could be plastic tool which might solve the pres bottlenecks.

Though some of the smaller au makers must be looking agh at the increasing capital dema of the automobile business, outlook for those who can st the gaff and for the economy g erally is rosy.

Auto, Truck Output

U. S. and Canada

	1955	1954
January	780,780	594,467
February	770,530	574,215
March	955,027	672,858
April	936,994	676,269
May	913,257	621,318
June	825,031	635,540
July	815,324	543,344
August	736,039†	523,799
September		364,441
October		312,078
November		616,395
December		761,954
Total		6,896,678

Week Ended	1955	1954
Sept. 3	105,680	110,995
Sept. 10	98,546	84,743
Sept. 17	146,484	74,026
Sept. 24	151,804	72,804
Oct. 1	143,566†	84,110
Oct. 8	153,000*	81,610

Source: *Ward's Automotive Reports*
†Preliminary *Estimated by STEEL

Exhaust Notes

Ford Motor Co. has just beg its model broadening. In addit to the Continental introduced l week, separate lines of the upcc ing Edsel, a super Mercury and Fairline line of cars are repor in the inner works. Ultimate obj tive would be eight lines of ca two per dealer, sharing four bo shells and thoroughly covering t market from top to bottom. effect a normal and deluxe versi of each line, the cars are plann as distinctively different in appea ance and bearing different nam which will peg them in the prop status.

The world's largest stampi plant could be the designation Chrysler Corp.'s facility to be bu near Macedonia, O. To be operat by the firm's automotive bo division, the plant will draw st from Pittsburgh, Youngstown, a Cleveland, feeding 28 lines presses including 260 machin with up to 1800-ton capacity.

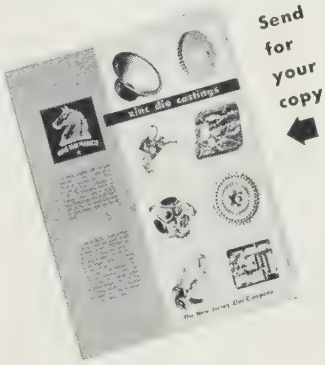
Incidentally, automakers are b ing shown a new press which c turn out 25 door panels per mi ute, compared with 15 per minu on machines in use. Secret of t the machine: A lower table whi moves up to blank with the to then comes down to form.

Fuel injection, much talke about in auto circles, appea headed for limbo, according some. Their reason: Injection costly, gives only about 10 to 1 per cent increase in fuel econom and 20 to 25 per cent increase horsepower. Cubic inches, the argue, are cheaper.

fine appearance as demanded by SCHICK INCORPORATED

The brand-new Schick "25" electric shaver, commemorating Schick's Silver Jubilee, not only is claimed to be a completely new concept in electric shaving, but demonstrates the outstanding results of the latest techniques in precision product engineering. The "business end" of the palm-sized new "25" is composed essentially of the four ZINC die castings illustrated above. When chromium plated, these metal components contrast beautifully with the gleaming white plastic housing.

The ZINC die castings are shown as they are received by Schick from the die caster. Not only are all assembly elements accurately cast, but the design details (note the raised trade mark and the recessed lettering on the nameplate) are sharply defined. *No machining is required* and, since the castings are ZINC, standard plating procedures are used. The right and left hand "whisk-its" (which snap open for easy cleaning) and the shearing head divider are bright chrome. The nameplate is finished in a soft silvery satin with the recessed lettering painted black to provide quick product identification.



Send for your copy

Appearance is just one of many considerations which dictate the choice of ZINC die castings in product engineering. Send for our brochure and contact any commercial die caster for the answers to your particular production problems.

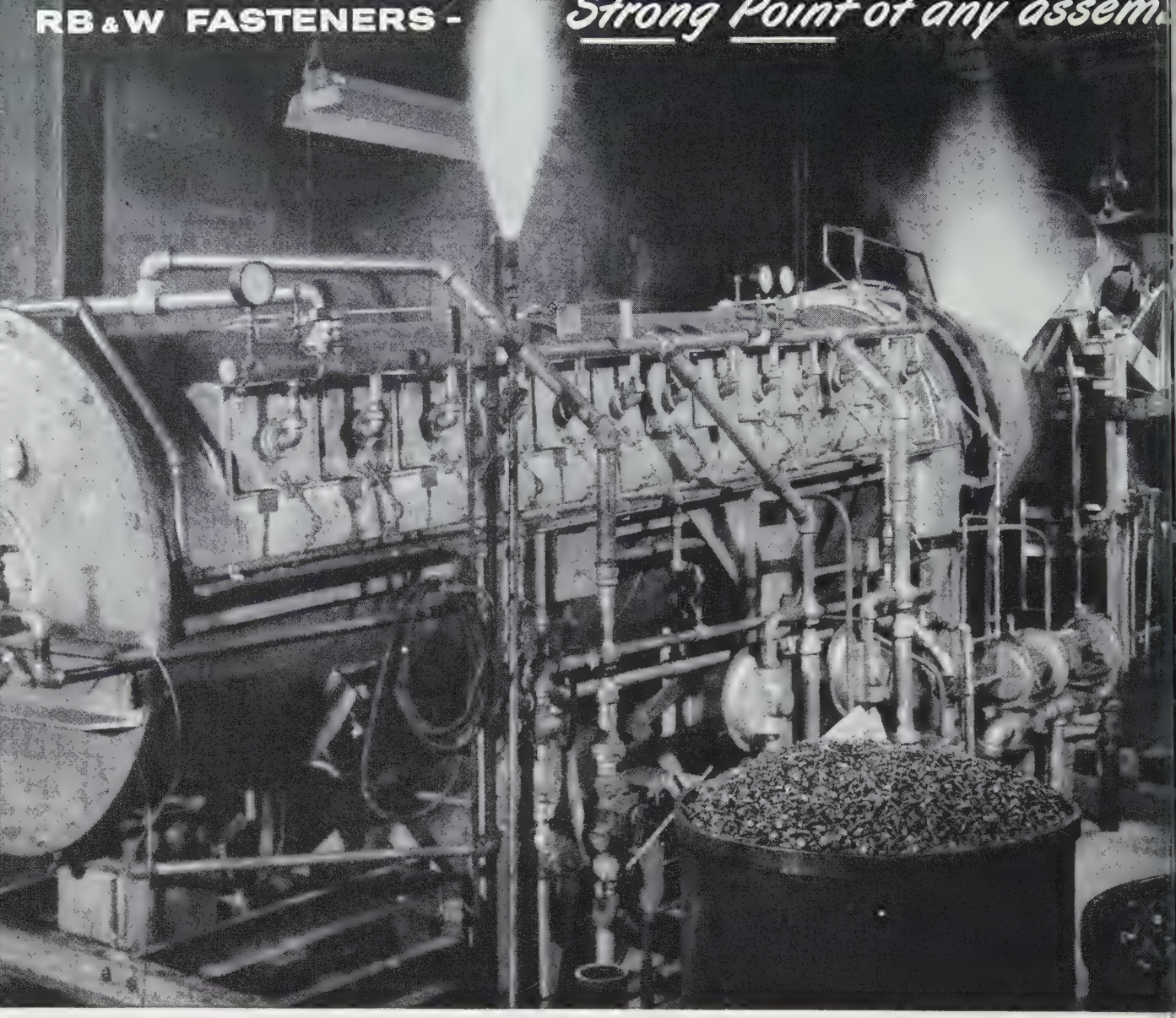
ZINC
FOR DIE CASTING ALLOYS

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

RB&W FASTENERS - *Strong Point of any assem*



Gas chamber for fasteners that lengthens their life

CARBURIZING of fasteners is being done here . . . *GAS* carburizing. This method stands head and shoulders above the bath type treatment. It gives greater control of surface hardness, of quality.

Above, Gene Luzzi, has just loaded a hopperful of *Spin-Lock* screws into the chamber. Heated and then quenched under his experienced eye (11 years with RB&W), the screws emerge with deeper, more uniform case hardness, and controlled core strength. RB&W hinge pins, tapping screws and other fasteners get their longer life in this department.

If there's a better method or some extra special equipment that can help turn out the best fasteners possible, you're sure to find it in RB&W plants. With the most modern and complete facilities available, RB&W's skilled operators — many of whom are second generation RB&W men — can put their experience to best advantage.

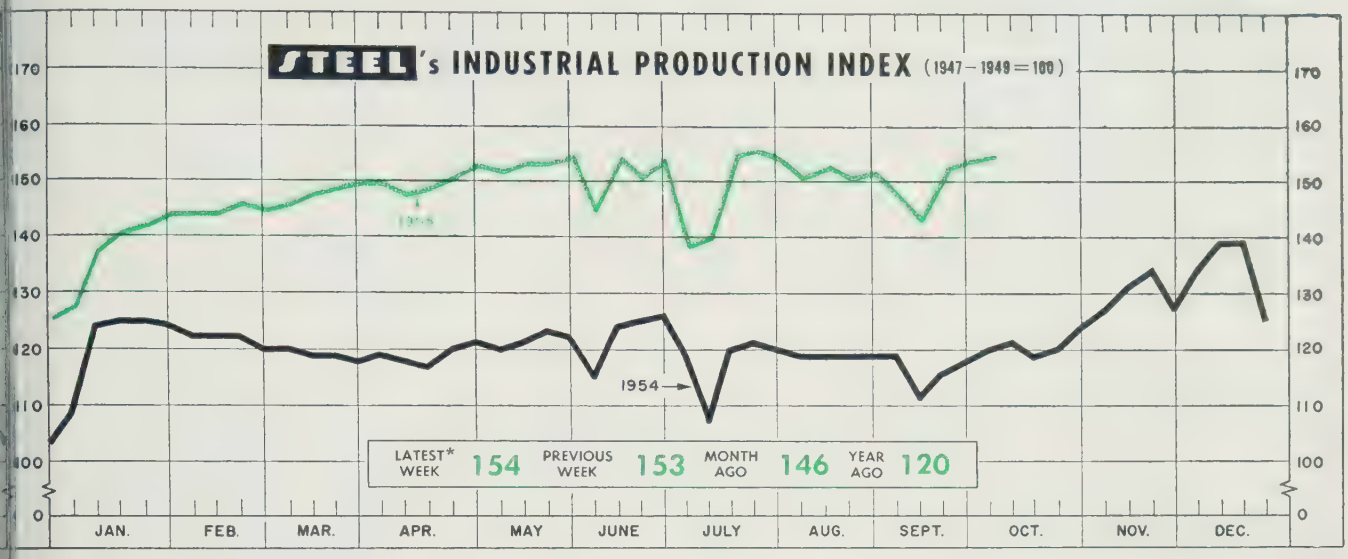
This combination of facilities, experience and quality control can't miss. It assures you more quality for your money . . . a reliable source of supply . . . and strong fasteners that never let you down.

Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

R B & W

110th year

Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. **Additional sales offices at:** Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco. **Sales agents at:** Milwaukee; New Orleans; Denver; Seattle. **Distributors** from coast to coast.



*Week ended Oct. 1. Based upon and weighted as follows: Steel Output, 35%; Electric Power Output, 32%; Freight Car Loadings, 22%; and Auto Assemblies, 11%

Business Will Hit New Peaks This Fall

NEW HIRING points the way to booming metalworking activity this fall. Autos will be one of the keys; good times in the auto plants spread out to many corners of metalworking—primary metals, stampings, diecasting (see page 103), hardware. Autos are off to a fast start in the 1956 model year. Also getting ready for a high level of fall business (as evidenced by swelling employment) are radio and television producers, machinery lines and instruments. Construction suppliers also get into the act, says the Labor department.

More Records — The activity points to a record gross national product in this quarter. Third-quarter GNP poked its nose over the $390-billion mark (annual rate) for a record. The fourth quarter is usually bigger; even in 1953 when the economy was sliding downhill that was true.

Encouraging this year: The momentum GNP has built up is all the result of private demand. Government spending has stayed about level; inventories are building slowly.

Spenders—Going up are spending for producers' durable equipment and plant outlays. Consumer spending is at an all-time high, accounting for about half the rise in GNP over the last year.

Another big factor in boosting GNP is record construction. No slowup is predicted. Dr. George Cline Smith, economist for F. W. Dodge Corp., states that during the next ten years the American economy will pour some $600 billion into building materials, construction labor and services.

Normal Growth—In that period some 12 to 13 million new housing units will be built. About $450 billion will be spent on new construction, $150 billion on maintenance and repairs.

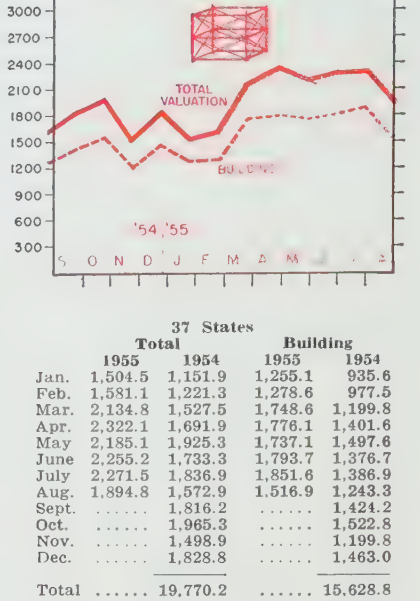
"This forecast," says Dr. Smith, "is conservative. It does not anticipate any construction boom, but simply a normal growth in line with the expansion of the nation."

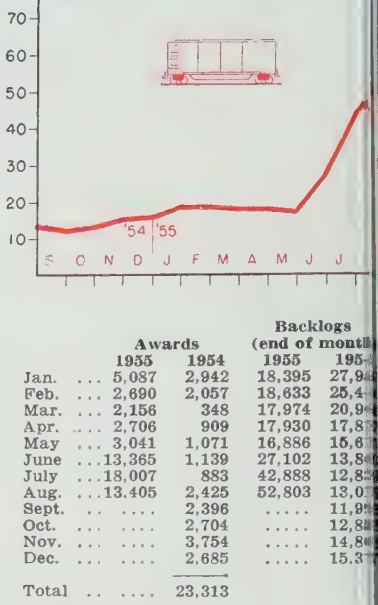
BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	2,330[1]	2,341	1,692
Electric Power Distributed (million kw-hr)	10,800[1]	10,756	9,072
Bitum. Coal Output (1000 tons)	9,635	9,970	8,262
Petroleum Production (daily avg—1000 bbl)	6,680[1]	6,671	6,184
Construction Volume (*ENR*—millions)	$266	$434	$234
Automobile, Truck Output (*Ward's*—units)	143,566[1]	151,804	84,110
TRADE			
Freight Car Loadings (1000 cars)	810[1]	819	710
Business Failures (Dun & Bradstreet, no.)	180[1]	171	212
Currency in Circulation (millions)[3]	$30,323	$30,401	$29,922
Dept. Store Sales (changes from year ago)[3]	+3%	+4%	+3%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$20,480	$22,848	$18,795
Federal Gross Debt (billions)	$277,426	$277,249	$274,669
Bond Volume, NYSE (millions)	$37,455	$22,988	$14,823
Stocks Sales, NYSE (thousands of shares)	21,693	12,038	9,494
Loans and Investments (billions)[4]	$84,516	$84,735	$82,980
U. S. Govt. Obligations Held (billions)[4]	$30,546	$30,940	$35,696
PRICES			
STEEL's Finished Steel Price Index[5]	207.63	207.63	194.19
STEEL's Nonferrous Metal Price Index[6]	264.6	263.2	218.2
All Commodities[7]	111.3	111.4	109.7
Commodities Other than Farm & Foods[7]	118.0	117.9	114.5

*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1955, 2,413,278. 1954, 2,384,549. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-1939=100. [6]1936-1939=100. [7]Bureau of Labor Statistics Index, 1947-1949=100

THE BUSINESS TREND





	37 States Total		Building	
	1955	1954	1955	1954
Jan.	1,504.5	1,151.9	1,255.1	935.6
Feb.	1,581.1	1,221.3	1,278.6	977.5
Mar.	2,134.8	1,527.5	1,748.6	1,199.8
Apr.	2,322.1	1,691.9	1,776.1	1,401.6
May	2,185.1	1,925.3	1,737.1	1,497.6
June	2,255.2	1,733.3	1,793.7	1,376.7
July	2,271.5	1,836.9	1,851.6	1,386.9
Aug.	1,894.8	1,572.9	1,516.9	1,243.3
Sept.	.....	1,816.2	.....	1,424.2
Oct.	.....	1,965.3	.....	1,522.8
Nov.	.....	1,498.9	.....	1,199.8
Dec.	.....	1,828.8	.....	1,463.0
Total	.....	19,770.2	.....	15,628.8

F. W. Dodge Corp.
Charts copyrighted, 1955, STEEL

	Awards		Backlogs (end of month)	
	1955	1954	1955	195
Jan.	5,087	2,942	18,395	27,9
Feb.	2,690	2,057	18,633	25,4
Mar.	2,156	348	17,974	20,9
Apr.	2,706	909	17,930	17,8
May	3,041	1,071	16,886	15,6
June	13,365	1,139	27,102	13,8
July	18,007	883	42,888	12,8
Aug.	13,405	2,425	52,803	13,0
Sept.	....	2,396	.....	11,9
Oct.	....	2,704	.....	12,8
Nov.	....	3,754	.....	14,8
Dec.	....	2,685	.....	15,3
Total	....	23,313		

American Railway Car Institute

A Basic Annual Market . . .

Keeping homebuilding at a high rate will be nonfarm household formations (estimated at more than 800,000 in the past year) and 300,000 to 400,000 housing units estimated to be withdrawn from the market each year. While many other factors influence housing demand, the pressure of household formations, combined with the disappearance of existing housing, should provide a basic annual market for 1.2 million to 1.3 million housing units a year during the decade.

Dr. Smith adds: "Obviously, this forecast does not envision a major war or depression during the decade, because there seems to be little basis for expecting either. On the other hand, it does not assume a runaway boom but actually would allow leeway for a mild recession during one or two of the ten years."

Comeback in Machine Tools . . .

Machine tool orders in August made a small gain over July to round out the first eight months of 1955 at 41 per cent higher than at this time last year. The month was third best of the year, according to the National Machine To Builders Association.

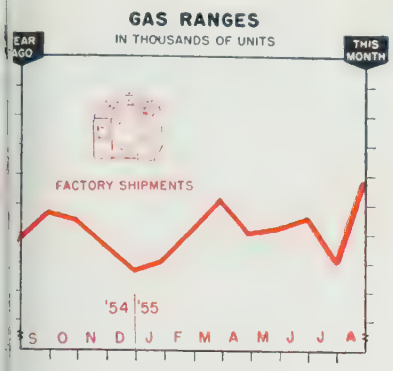
Orders outpaced shipments $65 million to $48.8 million. Resu was that backlog grew to almost months—a figure most builde look on as close to ideal. T present 5.7-month backlog is t nearest it has been to the si month "goal" in about two yea

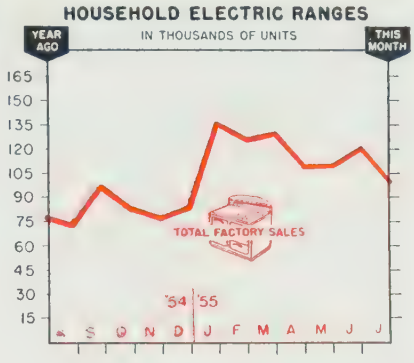
For the fourth straight mont total bookings of fabricated stru tural steel exceeded 300,000 to The August total showed an i crease of 16 per cent over the co responding month of last yea Total bookings to date are 37 p cent ahead of the same 1954 p riod, reports American Institu of Steel Construction.

Shipments in August of 266,7 tons were 22 per cent over Jul though down from a year ag To date, shipments of 1.9 millio tons are 12 per cent under la year at this time. Backlogs pushe up to 1.8 million tons, highe since the end of 1953.

Atoms for Peace . . .

Nuclear research reactors sel ing for about $200,000 are now practical goal, says Malcolm Ferguson, president, Bendix Avia tion Corp. Cost has run $2 millio





	Shipments—Units 1955	1954	1953
Jan.	152,900	137,000	169,200
Feb.	186,200	152,900	185,900
Mar.	217,300	188,200	208,200
Apr.	182,300	172,400	220,300
May	187,400	163,800	181,000
June	196,500*	174,300	166,600
July	149,500*	134,500	159,000
Aug.	233,400*	179,400	186,800
Sept.	.....	203,900	209,500
Oct.	.....	197,100	203,900
Nov.	.....	174,000	158,500
Dec.	.....	147,300	134,400
Total	.....	2,024,800	2,183,300

Gas Appliance Mfrs. Assn.

	Total Factory Sales—Units 1955	1954	1953
Jan.	136,663	101,870	88,145
Feb.	127,188	109,647	114,465
Mar.	130,180	115,393	130,788
Apr.	108,619	92,751	118,999
May	109,263	82,649	114,404
June	120,100	85,854	113,086
July	83,652	80,017	77,836
Aug.	.....	75,907	74,326
Sept.	.....	99,611	84,481
Oct.	.....	84,321	73,422
Nov.	.....	79,340	55,748
Dec.	.....	85,033	73,870
Total	.....	1,092,393	1,119,570

National Electrical Mfrs. Assn.

"The significance of this cost reduction is that the reactor has now become an economically practical tool for industrial and university research," Mr. Ferguson points out. "With the increasing availability of research reactors to scientific groups, the engineering problems involved in the use of atomic energy—such as the effect of radiation on different materials and the utilization or disposal of radioactive by-products—may be solved and the age of atomic power can become a reality.

"The manufacture of radioactive isotopes — those useful variations of the elements which have been found so effective in medicine, agriculture and industry—also will be accelerated as a result of the commercially practical reactor."

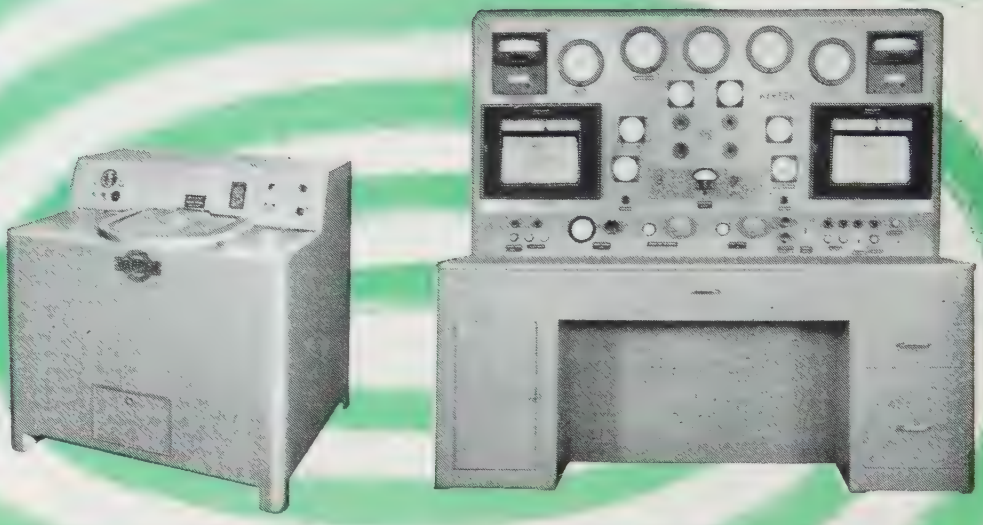
Good Business Ahead . . .

American business will continue at a high level through the remainder of 1955 and into 1956, believes Gilbert W. Chapman, president, Yale & Towne Mfg. Co.

Mr. Chapman's confidence is based on his observations of business in general and Yale & Towne's outlook in particular. With 16 per cent more sales for the first eight months of 1955 than in the same 1954 period, the company's net earnings are way up. Rate: more than 200 per cent higher than last year's. Orders already booked for the remainder of the year indicate a fourth quarter of even higher earnings. It's possible that Yale & Towne could finish up 1955 with net earnings double those of last year.

Trends Fore and Aft . . .

Resistance Welders Manufacturers' Association reports business in the first eight months is 30 per cent above orders during that part of 1954. Shipments for the period are up 12 per cent . . . Makers of diesel trucks have a good chance to set a production record in 1955 . . . George A. Bryant, president, Austin Co., sees the next 12 months as "increasingly difficult" for builders using steel, copper, cement and other critical materials and equipment . . . Freight car loadings in the fourth quarter will be 9.3 per cent above those of last year, say the 13 Regional Shippers Advisory Boards of the Association of American Railroads . . . McDonnell Aircraft Corp. expects to further increase employment, which is already approaching the 1953 peak.



MODEL SC-95 CENTRIFUGE

Speeds to 25,000 RPM, producing to 30,000 G's and higher. Ultra high acceleration and dynamic braking enables this unit to fulfill today's requirements for high production test cycles. Manual or semi-automatic operation.

MODEL VHS UNITS

Speeds to 80,000 RPM and higher. Various size models for loads to 3,000 pounds. Optional equipment available for heating test specimen, up to 3,000° F. Instrumented for advance stress analysis.

The world over . . . engineers, designers, test men, technicians, scientists, and management are placing their high speed test requirements in the hands of our trained staff • Missile Components • Fuses • Turbine Motors • Gyros • Electronic Tubes are **overspeed tested** under closely simulated conditions in

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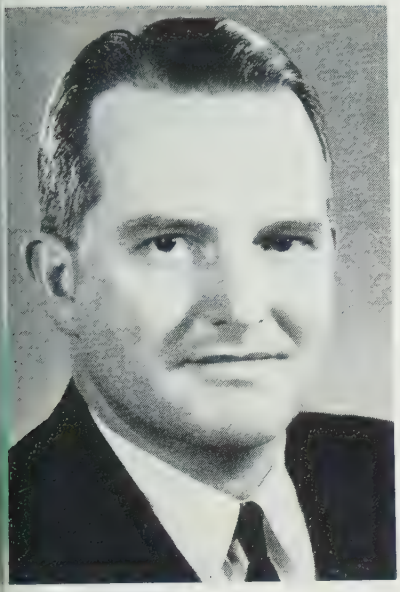
AMERICA'S LARGEST BUILDER OF SPINTESTING UNITS



JEROME F. FERDINAND
. . . Punch Products sales manager

ome F. Ferdinand was made es manager, **Punch Products rp.**, Niagara Falls, N. Y. He ently resigned from Wales-ippit Corp., where he was vice sident-sales and a director.

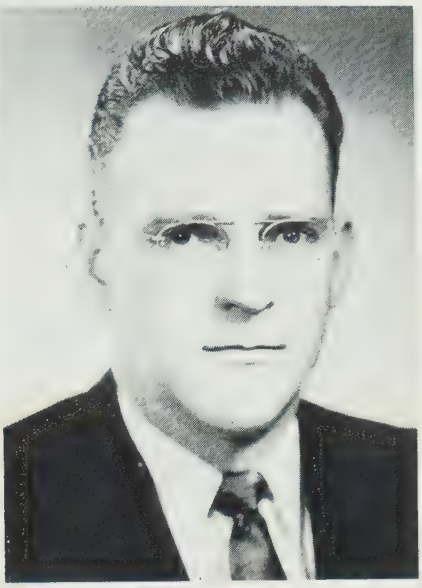
in P. Borda was made general nager, **Magnus Metal Division,** tional Lead Co., New York. **ward M. Van Winkle** becomes sident of Magnus Metal Corp., sidiary. Both positions were d by **William V. Burley,** also a e president of National Lead, o has retired.

T. Lancaster, manager of engi-ering, was appointed plant nager of **Rycenga Mfg. Co.,** De-it. He will direct all produc-n and engineering facilities.

rin W. Barker, since 1952 chief gineer, **Kearney & Trecker rp.,** Milwaukee, was elected vice sident-engineering. He suc-ds **Joseph B. Armitage,** who ntinues as vice president-con-tant.

J. Livengood was promoted to nt manager at **West Engineer-g Co. Inc.,** Richmond, Va. He is placed by **Robert L. Alexander** plant superintendent.

il E. Geisler was promoted to ief production engineer of **uder, Paeschke & Frey Co.,** Mil-ukee.



C. IRWIN HOCHHAUS
. . . Penco Metal Products plant mgr.

C. Irwin Hochhaus was made plant manager of Alan Wood Steel Co.'s new **Penco Metal Products Division,** Conshohocken, Pa. He was with De Luxe Metal Furniture Co.

American Welding & Mfg. Co., Warren, O., named **Willard R. Richards** production control supervisor; **R. E. Goodman,** quality supervisor; **Forrest W. Johnson,** plant metallurgist; and **Raymond F. Zeller,** chief inspector.

Ralph C. Moffitt, director of purchases, was elected assistant vice president and director of purchases for **United States Steel Corp.,** Pittsburgh. He assumes duties of **R. L. Van Cleve,** assistant vice president-purchases, who has retired. **William W. Crawford** was made assistant director of purchases and **Everett G. Barrett,** purchasing agent, electrical and mechanical equipment. Mr. Barrett retains his present position of purchasing for foreign operations.

Thomas W. Eastwood was made general sales manager of **Permattach Diamond Tool Co. Inc.,** Milford, N. H. He was with Austin-Hastings Co.

C. L. Peterson was elected vice president and general manager, **Brown Instruments Division,** Philadelphia, Minneapolis - Honeywell Regulator Co.

RUSSEL B. CAPLES
. . . Anaconda v. p.-metallurgical operations

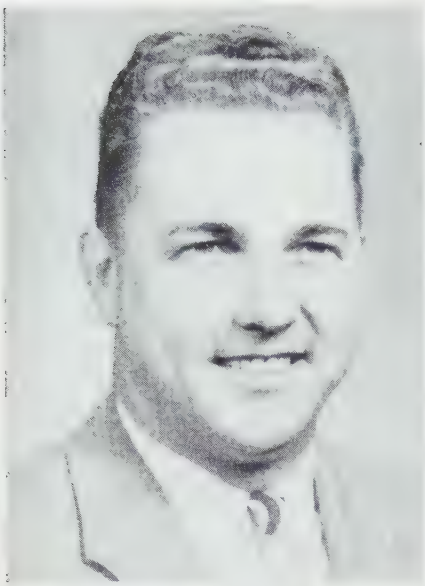
Russel B. Caples, president of Anaconda Aluminum Co., was elected vice president-metallurgical operations of the parent company, **Anaconda Co.,** New York. He will be assisted by **William Wraith Jr. C. Jay Parkinson** was elected vice president of Anaconda Aluminum and **Robert F. Buechner** was named assistant to the president.

Andrew Kalitinsky was appointed manager of the nuclear research and development department at the Fort Worth, Tex., plant of **Convair,** a division of General Dynamics Corp. He succeeds **Dr. R. N. Little** who has returned to the University of Texas faculty.

W. R. Miller was named director of manufacturing at **Longren Aircraft Co.,** Torrance, Calif.

Robert B. Murray Jr., former undersecretary of commerce, was made a vice president and a director of **Baldwin - Lima - Hamilton Corp.,** Philadelphia. He has been assistant to the B-L-H president since leaving his government post. **James M. White** was elected vice president - manufacturing, resigning a similar post at ACF Industries Inc. **Col. John R. Martin,** U. S. Air Force, ret., was elected vice president-electronics and instrumentations.

Robert A. Daggit was made assistant sales manager for the Chi-



ROBERT A. YOUNG JR.
. . . Continental Electric sales mgr.

C. DON HICKS
. . . Michiana Products vice president

RALPH R. SWAIN
. . . Bailey Meter division mgr.

cago plant of **Joseph T. Ryerson & Son Inc.**

Robert A. Young Jr. was made sales manager of **Continental Electric Equipment Co.**, Cincinnati. He was sales representative for General Cable Corp. **R. E. Welch** was made controller.

Richard G. Widdows, chairman of **Electric Controller & Mfg. Co.**, Cleveland, has retired. He continues as a director and in a consulting capacity. Mr. Widdows joined the company in 1909 and served as president from 1943 to 1952.

Lithium Corp. of America Inc., named **Herbert H. Schroeder Jr.** coordinator in the new product research and development department at Minneapolis.

H. F. Devens was made sales manager for Roll Bond in the metals division of **Olin Mathieson Chemical Corp.**, New York.

Theodore F. Smith joined **Kaiser Engineers Division,** Henry J. Kaiser Co., Oakland, Calif., as industry consultant. He is assigned to industrial development and will have offices at regional headquarters in Pittsburgh.

George F. Unbehaun was made sales manager and **Donald Aingworth** general manager of **Herbster Furnace Co.**, Cleveland, subsidiary, Bettcher Mfg. Corp.

C. Don Hicks was elected vice president of **Michiana Products Corp.**, Michigan City, Ind. He was formerly with Eaton Mfg. Co.

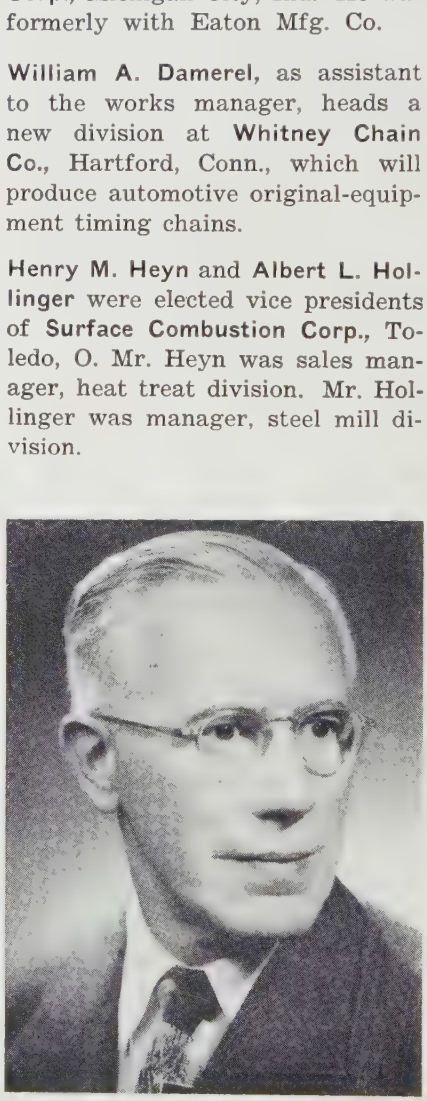
William A. Damerel, as assistant to the works manager, heads a new division at **Whitney Chain Co.**, Hartford, Conn., which will produce automotive original-equipment timing chains.

Henry M. Heyn and **Albert L. Hollinger** were elected vice presidents of **Surface Combustion Corp.**, Toledo, O. Mr. Heyn was sales manager, heat treat division. Mr. Hollinger was manager, steel mill division.

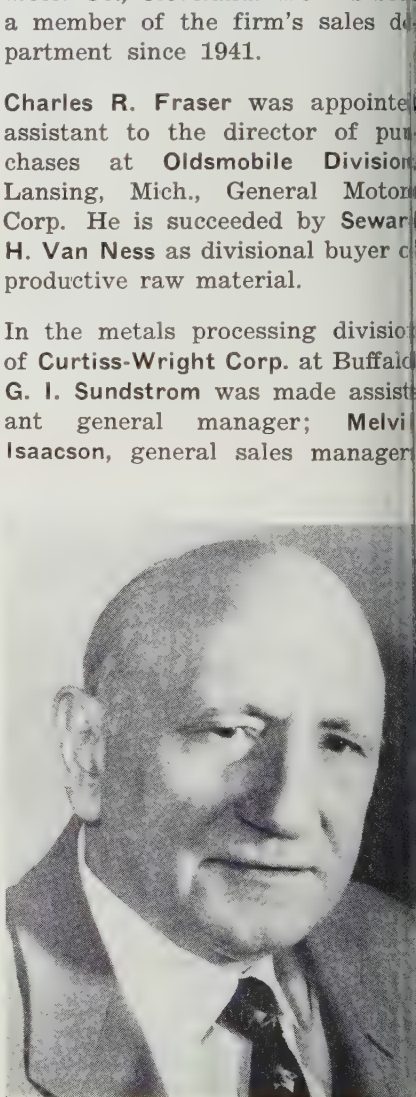
Ralph R. Swain was named manager, iron and steel division, **Bailey Meter Co.**, Cleveland. He has been a member of the firm's sales department since 1941.

Charles R. Fraser was appointed assistant to the director of purchases at **Oldsmobile Division**, Lansing, Mich., General Motors Corp. He is succeeded by **Seward H. Van Ness** as divisional buyer of productive raw material.

In the metals processing division of **Curtiss-Wright Corp.** at Buffalo **G. I. Sundstrom** was made assistant general manager; **Melvin Isaacson,** general sales manager



HENRY M. HEYN

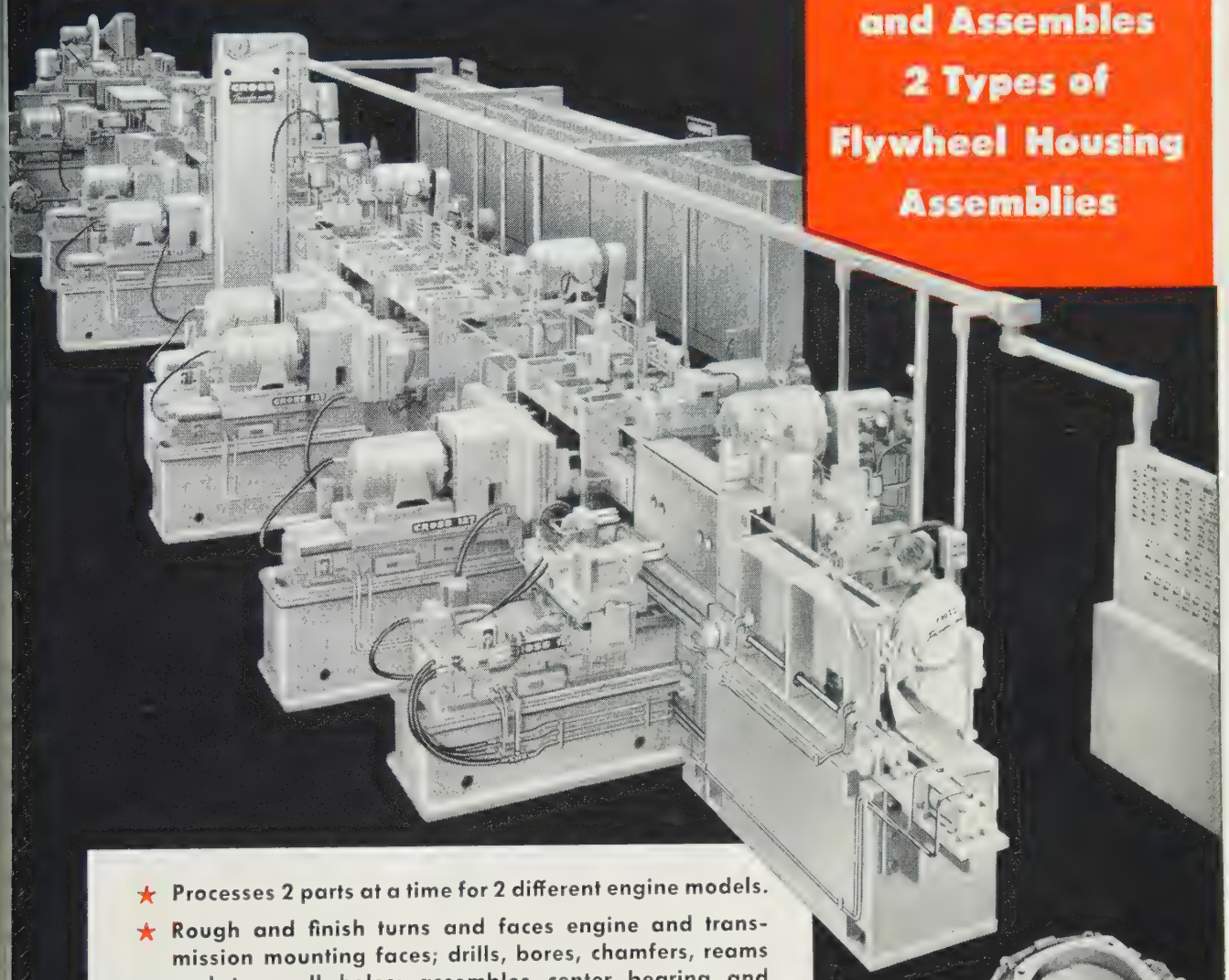


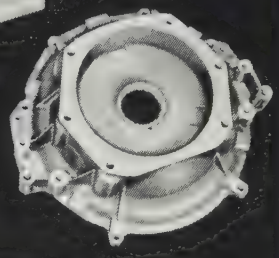
ALBERT L. HOLLINGER

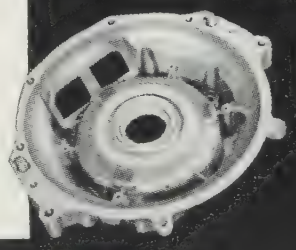
. . . Surface Combustion Corp. vice presidents

Another Transfer-matic by Cross

Bores, Faces, Drills and Assembles 2 Types of Flywheel Housing Assemblies







- ★ Processes 2 parts at a time for 2 different engine models.
- ★ Rough and finish turns and faces engine and transmission mounting faces; drills, bores, chamfers, reams and taps all holes; assembles center bearing and 2 dowels; finish bores and inspects center bearing after assembly; washes, dries parts for final assembly.
- ★ 314 pieces per hour at 100% efficiency.
- ★ 20 stations: 1 loading; 10 machining; 2 assembling; 4 inspecting; 2 cleaning; 1 unloading.
- ★ Pre-set tools to reduce downtime for tool changing.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Construction to J.I.C. standards; hydraulic feed and rapid traverse; hardened and ground ways; automatic lubrication.

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THE **CROSS** CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

ROBERT D. FLEISCHER
. . . Beryllium div. sales mgr.

ROBERT E. SCHROEDER
. . . Luria Bros. Cleveland district mgr.

JOHN H. BOUWMEESTER
. . . General Ceramics v. p.-mfg.

and **John G. Rombough,** industrial relations manager.

Robert D. Fleischer was named sales manager, safety tool division, **Beryllium Corp.,** Reading, Pa. **Walter S. Pollard** was made advertising and sales promotion manager.

P. T. Lagrone was made manager of electric utility sales for **Westinghouse Electric Corp.,** Pittsburgh. He succeeds **C. V. Roseberry,** who was named manager of the new commercial atomic power department. **Dr. William E. Shoupp** will be technical director of that new department. **George B. Meyer** was made manager of defense products, Dayton, O., office; and **Romus Soucek,** manager of defense products, West Coast, with headquarters in Los Angeles.

R. E. Dietz Co., Syracuse, N. Y., appointed **G. L. Petrie** purchasing agent to replace **Charles F. Marchant,** who will retire Jan. 1.

Robert E. Schroeder was made Cleveland district manager of **Luria Bros. & Co. Inc. Merle Nobel** will supervise activities in the Cincinnati area.

J. S. Gillespie, manager of product planning, was made manager of the new diamond project section of General Electric Co.'s **Carboloy Department,** Detroit.

Harold H. Hill was made general manager, automotive finishes, **Pittsburgh Plate Glass Co.,** Pittsburgh.

E. G. Hotze succeeds **F. H. Hayes** as Houston district manager of **Clark Bros. Co.,** Olean, N. Y. Mr. Hayes, vice president and district manager at Houston, has retired.

Benjamin S. Head was made superintendent of the finishing department at the Defiance, O., plant of **Central Foundry Division,** General Motors Corp.

General Ceramics Corp., Keasbey, N. J., appointed **John H. Bouwmeester** vice president of manufacturing and a director. He held a similar position with Indiana Steel Products Co. **James W. Schallerer** was made project engineer.

A. Henry Casey was made manager, closed circuit television division, **Hallamore Electronics Co.,** a division of Siegler Corp. He has headquarters in Chicago. Mr. Casey was assistant general sales manager of Ekco Products Co.

Edwin B. James was made assistant sales manager of **McKay Machine Co.,** Youngstown.

Barnabus P. Toth was named sales engineer of **Hamilton Mfg. Co.,** New Haven, Conn.

Frank L. Rubin, heat transfer engineer, joins the sales engineering staff of **Downingtown Iron Works Inc.,** Downingtown, Pa.

OBITUARIES . . .

Harry F. Kellogg, 76, president, **Central Screw Co.,** Chicago, died Sept. 21.

Theodore S. See, 70, vice president, **La Salle Steel Co.,** Hammond, Ind., died Sept. 22.

Edwin W. Hanke, 47, plant superintendent for **Allen-Bradley Co.,** Milwaukee, died Sept. 20.

Dr. Joseph B. Ennis, 76, former senior vice president, **American Locomotive Co.,** died Sept. 22 in Paterson, N. J.

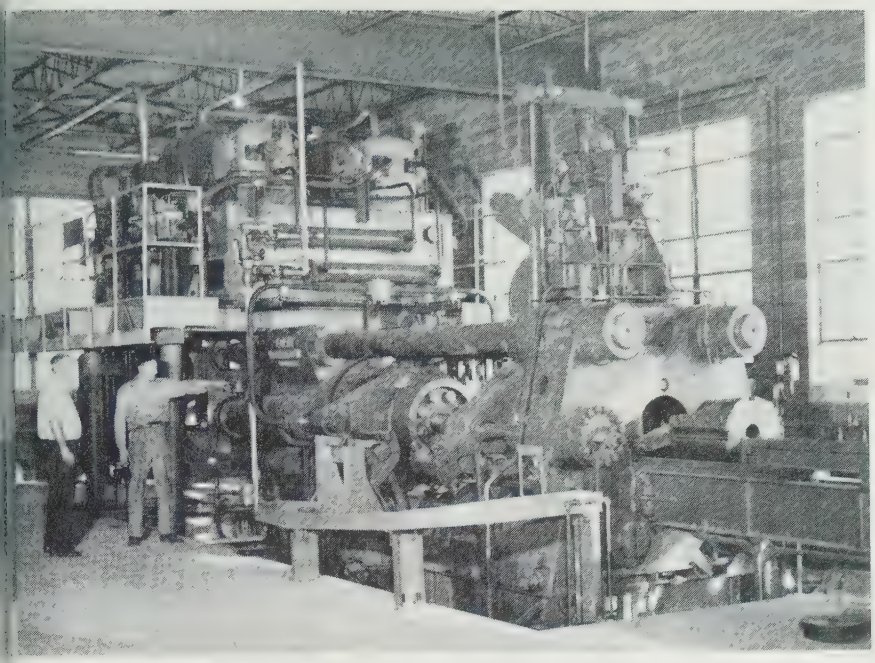
George T. Kearns, 54, secretary-treasurer and a director of **Kennametal Inc.,** Latrobe, Pa., died Sept. 25.

Adolph W. Machlet, 90, chairman of **American Gas Furnace Co.,** Elizabeth, N. J., died on Sept. 27.

Hyman Wernick, 62, president, **Sterling Metal Products Co.,** Newark, N. J., died Sept. 27.

C. R. Genung, metallurgist, **Ross-Meehan Foundries,** Chattanooga, Tenn., died Sept. 25.

John R. Van Dusen, 54, regional manager at Cleveland for **Wayne Pump Co.,** died Sept. 29.



eading firm offers rod, tubing, special shapes as . . .

eryllium Industry Matures

CRYLLIUM - COPPER wrought oducts of improved quality are ailable to industry in larger antities and in wider varieties. ason: A two-year, $2-million exinsion program at Beryllium rp., Reading, Pa., which is just out completed.

For the first time, the industry using mass production and qual- control techniques that have en applied successfully in steel d aluminum mills.

Wider Market — "Growing acptance of beryllium copper as a sign material . . . as well as the ospects of new commercial apcations now in pilot-run stages, ore than justify this major modnization program," explains Lawnce F. Boland, vice president.

Expansion of wrought alloy finning capacity by 60 per cent is t one phase of an over-all proam that calls for eventual enrging of company facilities for oduction of beryllium master alys as well as commercial casting got. As part of its current modnization program, Beryllium aldy has stepped up its capacity r production of beryllium-alumim master alloy.

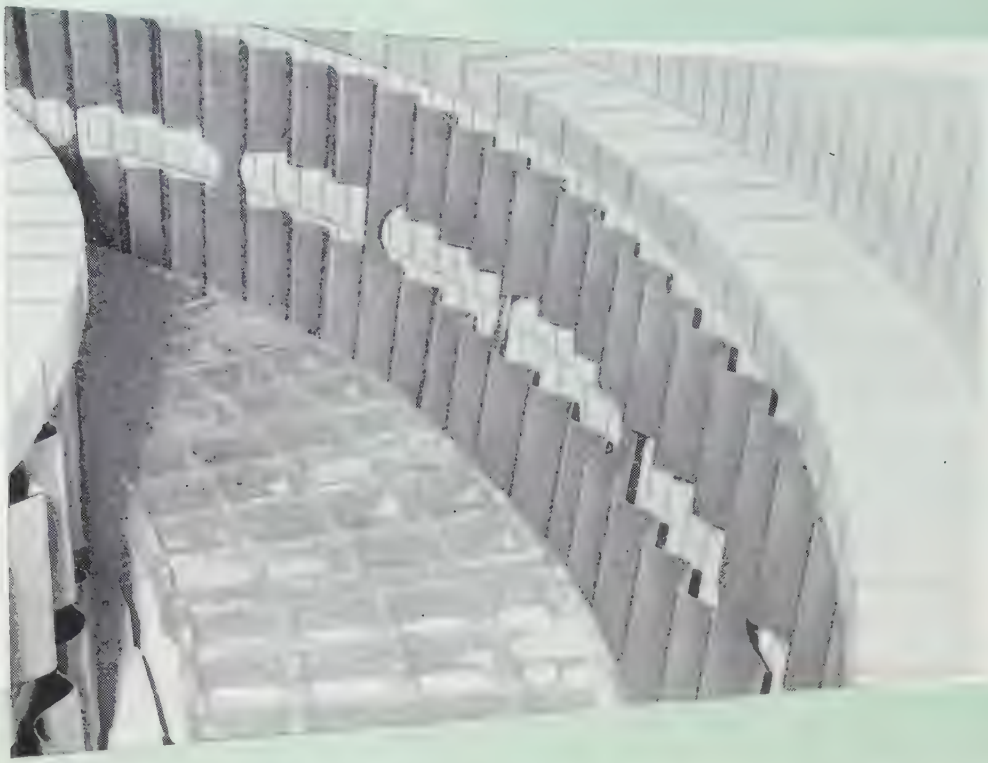
Diversification—Included in the esent expansion are a $450,000 extrusion press (above) that will produce seamless beryllium-copper tubing and special shapes of a type never before available in production quantities; a $160,000 Sendzimir cold-rolling mill of advanced design that permits production of thinner-gage, closer-tolerance beryllium-copper strip, in commercial widths almost twice that previously available; and a $100,000 direct reading spectrometer that automatically analyzes foundry samples for as many as 12 metallic elements while a heat is still molten.

Additional new equipment includes: Cold-finishing mills, high-volume annealing furnaces; auxiliary continuous strip welding, bar-rolling, straightening and slab milling production machines.

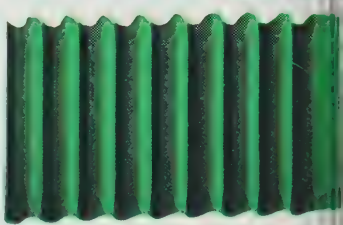
Beryllium expects to get a large measure of product diversification from its giant new hot extrusion press. It will be used initially to supplement the plant's hot mills in the production of standard rod and wire stock, but the new press probably will be producing quantities of seamless beryllium-copper tubing soon. By the end of the year, the company hopes to be extruding special structural shapes.

(*Please turn to page* 130)

NOW AVAILABLE IN FIELD-ERECTED FURNACES



ELECTRIC



CORRTHERM elements are large co rugated sheets of nickel chromium an were developed in Lindberg labora tories by Lindberg metallurgists an engineers. At the left, installation c CORRTHERM elements in large rotar furnace currently being erected b Lindberg Industrial in plant of a lead ing automotive parts manufacture

FOR ELECTRIC FURNACES ... FOR GAS FURNACES

GAS

The famous Lindberg "dimple" verti cal radiant tube, designed by Lind berg engineers has proved its superior efficiency in hundreds of furnace installations since 1953. The photo graph at the left shows its installation in a large pusher-type furnace built for a leading automotive manufacturer.

Visit Lindberg Industrial Corporation Booth 230 at the ASM Show in Philadelphia, October 17 to 21. See these revolutionary new heating elements and get full details of LIC service.

LINDBERG

LINDBERG INDUSTRIAL

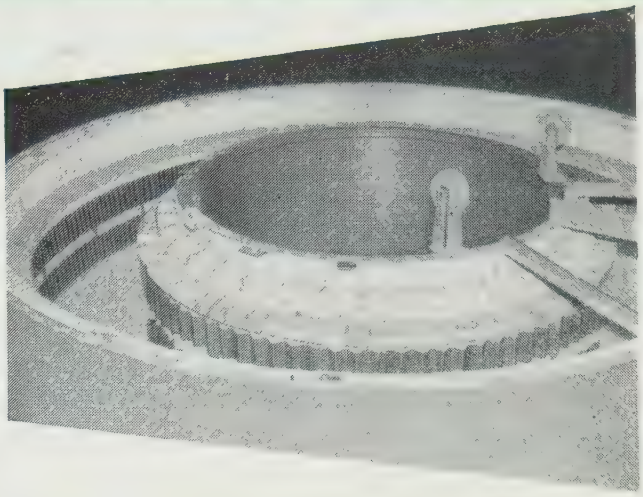
Y LINDBERG INDUSTRIAL!

'here source of heat is electricity!

ORRTHERM, Lindberg's radically advanced w electric heating element offers advantages ver before available for heat treating furnaces. ith this new element even carburizing and carnitriding with electricity becomes practical, ficient and economical.

CORRTHERM elements operate at extremely w voltage. Consequently, leakage through carn saturation and shock or short hazards are minated. Elements also act as baffles to direct culation of convection streams.

CORRTHERM elements are practically indeuctible. Work load or operator's charging tool n't hurt them. Watts density is at all time low. asily installed or replaced, too, as element erely hangs in furnace and no complicated ountings are required.



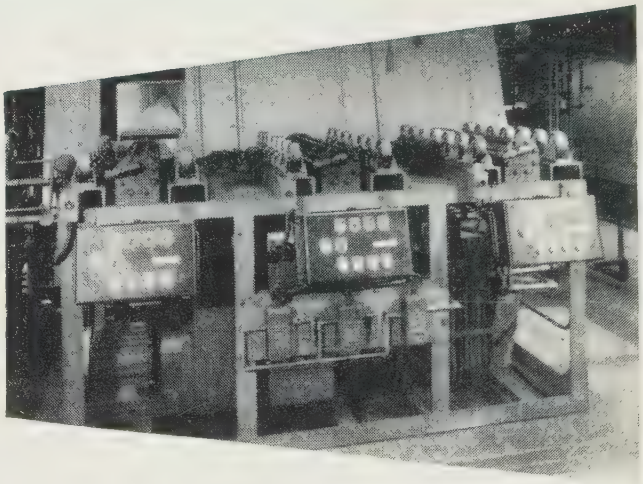
A construction photo of one of two large rotary carbonitriding furnaces now being built by Lindberg Industrial for a leading automotive parts manufacturer. A section of this same furnace is shown on the opposite page.

HE MOST ADVANCED HEAT ELEMENTS YET DEVELOPED

'here gas is the source of heat.

cause of Lindberg's revolutionary design, this be provides a new level of furnace performce. The secret lies in the new Lindberg tube's limples." The tube carries a central stream of ixed air-and-gas surrounded by a cylindrical eam of air alone. Combustion occurs in the ea between these two streams. The "dimples" eate eddies accelerating combustion and mainining even temperatures along the entire tube. This Lindberg tube will operate at maximum iciency for a longer period of time. The special otective coating gives greatest possible resistce to carbon penetration. Vertical position minates soot deposit and resultant temperature creases at points of sooting.

Tubes are just 59 inches long and weigh only pounds, changeable in a few minutes. No stly furnace shut-downs and no high labor and aterial cost for tube changes.



This three-row pusher-type carburizing furnace provides maximum heat uniformity through use of Lindberg vertical radiant tubes installed between each row as well as at side walls, providing accurate control of case depth and properties. This highly efficient furnace with Lindberg vertical radiant tubes carburizes 650 lbs. of gears per hour with an effective case of .055".

NDUSTRIAL CORPORATION

Specialists in Field-erected Equipment

ICAGO PLANT: 2321 WEST HUBBARD STREET, CHICAGO, ILLINOIS
S ANGELES PLANT: 11937 REGENTVIEW AVE., AT DOWNEY, CAL.

Lindberg Industrial provides a complete consulting, designing and construction service including completed installation in your own plant. Call your nearest Lindberg Field Representative (see classified section of your telephone book) or write us direct.

(*Concluded from page* 127)

Cold-Rolled Products — Immediate expansion in product lines made possible by new cold-rolling equipment. Included are: Wide strip, up to 11 in.; thinner gage strip, down to 0.001 in.; larger coil sizes, weighing up to 600 lb; commercial straight wrought stock in sizes larger and smaller than previously available (rod stock down to 0.0625 in. in diameter; rectangular and hexagonal stock up to 2 in. thick); smaller rectangular bar stocks, down to 0.094 in. on a side.

The extrusion press can exert a force of 1700 tons on hot beryllium-copper billets weighing up to 100 lb. It will more than double Beryllium's hot working capacity, permitting the firm's hot mill to work almost exclusively on strip production. Initial extrusions will range from ⅝ to 1 9/16-in. in diameter, though smaller sizes may be produced with multiple extrusion dies.

Initial production of seamless beryllium-copper tubing will be in redraw sizes of about 2 in. diameter.

Engineering Firm Expands

Arthur G. McKee & Co., petroleum and steel engineering firm, will erect a $500,000 building to expand its home office and engineering facilities in Cleveland. The building will add about 35 per cent to its present 84,000 sq ft of floor space.

Starts Can Plant Construction

American Can Co., New York, has broken ground at Arlington, Tex., for a can factory to help meet the requirements of the expanding food packing industry in central Texas. Production is scheduled to start during 1956 and will reach an annual rate of 30 million containers a year at full capacity.

Chicago Distributor Expands

Diamond Steel Co. Inc., Chicago distributor of steel and aluminum products, acquired the L. A. Cobb foundry building at 5429 W. Roosevelt Road, that city. The new property will house Diamond

el's Flat Rolled Products Di-
ion. The firm's present plant
North Natoma avenue will be
intained for its Aluminum Di-
on. After remodeling, the
lding cost will be more than
0,000. The company is spend-
$25,000 for new mill-type
ipment. Expansion also will
e place in plate, bar, structural
wire departments.

REPRESENTATIVES

ewis-Shepard Products Inc., tertown, Mass., appointed E. D. nent Jr. representative in the Louis area.

Vestinghouse Electric Corp., sburgh, appointed Claud S. don Co., Chicago, distributor ts standard industrial furnaces related equipment. L. H. Gil-e is sales manager, Industrial ting Division, Meadville, Pa.

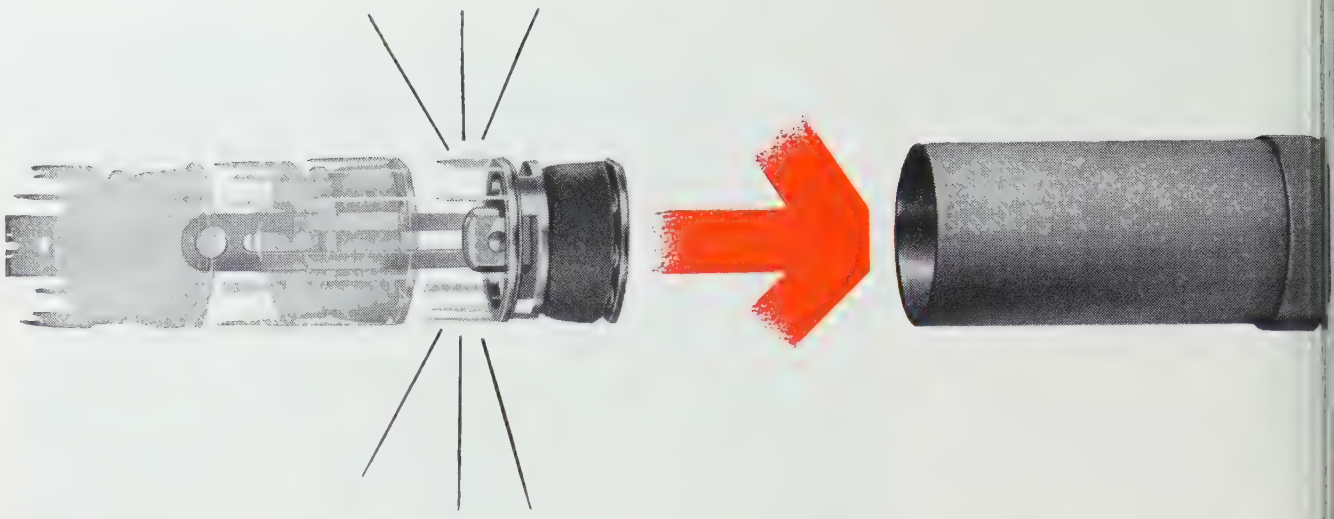
Hunter Spring Co., Lansdale, appointed Mezey Agency Inc., roit, representative for Michi- and adjoining sections of In-na and Ohio. Hunter makes ngs and wire forms of all ds, stampings and wire and ng testing instruments.

Meyl & Patterson Inc., contract-engineers, Pittsburgh, appoint-George M. Meriwether, Bir-gham, as sales representative its special materials handling ipment.

Vascoloy-Ramet Corp., Wauke-, Ill., appointed the following ributors for its cemented-car-e tools, toolholders, inserts and : Empire Tool Engineering Tucson, Ariz.; Cameron l & Supply Co., Cameron, Va.; Precision Tool & Engi-ring Corp., Philadelphia.

ewis & Co., Louisville, has n appointed representative in district for **Jones & Laughlin el Corp.'s Container Division,** sburgh.

ratt & Whitney Division, Niles-nent-Pond Co., West Hartford, n., appointed Southwest Indus-l Sales Co., Dallas, as its rep-ntative.



How to soak up shock and

Underwood Corporation did it by using Republic ELECTRUNITE Stainless Steel Tubing

This was the problem: find a material for th cylinder in the carriage shock absorber on a accounting machine. The cylinder must have a accurate bore, little variation in diameter, an negligible eccentricity. It must also have a sui able finish to reduce drag, because the pisto which fits inside must be completely retracted less than a tenth of a second.

Republic metallurgists suggested ELECTRUNIT Stainless Steel Tubing. It was drawn to me dimensional requirements. The finish was exce lent. And Underwood reports good service li because of excellent wearing qualities.

Republic Steel Corporation
3120 East 45th Street
Cleveland 27, Ohio

REPUBLIC STEEL

- ☐ Enduro® Stainless Steels
- ☐ ELECTRUNITE® Stainless Steel Tubing and Pipe
- ☐ Republic Nuts and Bolts
- ☐ Republic Chateaugay Pig Iron

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

K-7668

BUSINESS MACHINE PARTS COST LESS because they last longer when they're made of Republic Enduro Stainless Steel. On this Addressograph-Multigrap office machine, ink corroded the carbon spring steel from which the ribbo guards and lister spacing bands were made originally. Carbon steel als cracked under the operating strain. Enduro Stainless Steel resists this co rosion, has the necessary springiness and wears well, despite the abrasiv action of moving the ribbon.

STEEL
The Metalworking Weekly

The Metal Show Section

Choose the Right Arc Welding Electrode

By L. K. STRINGHAM
Vice president, engineering
Lincoln Electric Co.
Cleveland

THE DIVERSITY of metals which can be deposited in arc welding is staggering. This fact leads many people to believe the same to be true about electrode selection. However, when this diversity is better understood you can eliminate the guesswork in your selection and get consistently good welded joints.

Electrodes have been developed to meet the requirements of three groups of factors, all of which control (to some degree) what is best for any given application. The electrodes:

1. Supply deposited metal for making joints in different metals and alloys.
2. Provide required properties in the deposited metal.
3. Meet widely varying operating conditions under which the weld must be made and provide for service requirements of the weld other than those supplied by properties.

The Variables — A weld may have to meet any one of four, or combinations of these four, service requirements:

1. Liquid or air tightness under varying pressure conditions.
2. Good appearance.
3. X-ray quality inspection.
4. Joint strength equal to full plate strength.

These varying requirements become even further involved when you consider the wide range of welding conditions under which they must be met. They are:

1. Position of welding.
2. Fit-up of joints.
3. Type of joint.
4. Cleanliness of metal.
5. Gage size or thickness of metal.
6. Operator skill.
7. Type of welding current, ac or dc.

How to Control Them — The chemical analysis of coatings on electrodes is controlled to produce desired operating characteristics. Through coating control the arc must be made more or less forceful to give degrees of penetration. Size of droplets of metal in the arc, bead shape and smoothness, type of shielding, amount of slag and coating efficiency under heat can all be controlled by the electrode coating. Some characteristics however, are achieved at the expense of others.

Table 2 gives the important differences in operating electrode characteristics which distinguish the subdivisions within carbon steel classifications. An understanding of these differences is important if welds are to meet service requirements. Table 3 gives the applications as recommended by AWS-ASTM specifications. Beyond these characteristics and recommendations which are only general as to position and joint is a great volume of explanation for specific applications. The following will hit only the highlights.

Penetration at Normal Curre

This is the penetration or force found at the current n mally used with a specific e trode. Many factors may set normal current. Undercut, sp ter, cracking, porosity and change in arc characteristics fr the start to the finish are a few

Within broad limits any amo of penetration can be achie with any type or size of electr if the proper current is chosen penetration is the only thing are after. For example, 3/ penetration is possible with a 3/ in. EXX12 rod. But this i practical since the current wo be so high that penetration mi drop from 3/8-in. at the start the rod to 1/16-in. at the finish

Gaseous and Molten Shields

Some types of electrodes h large quantities of combusti (organic) material in the coati This material burns in the arc produces a gaseous shield to p tect the molten metal. When electrode has little of this c bustible material in the coati weld metal is protected ma with a molten slag shield.

As a general rule, electro which produce large quantities molten slag produce small amou of gaseous shields, and vice ve

Rate of Slag Solidification

The slags which solidify a

h temperature normally have igh rate of solidification. Such gs are used on electrodes with ich a whipping welding tech- ue is used. Molten slag solidi- very quickly after the arc is oved from the crater.

lthough the quick solidifying gs tend to confine the bead and p it from running, they do not mally produce a smooth weld d.

Arc Blow Stability

f there are no unbalanced ces acting, an arc will normal- ake the shortest path between electrode and the work and tend to travel between the molten points. Therefore, as electrode is moved along the m the arc tends to lag behind, earing to have a slight back- d blow.

n addition to these tendencies re are two types of forces act- upon the arc which produce blow. One is the unbalanced gnetic field set up by the cur- t flowing in the arc and in the k, the other is the arc force duced mainly by the chemicals in the electrode coating and the sheath at the tip of the electrode.

The former is at right angles to the arc and tends to blow the arc away from the tip of the electrode. The latter tends to make the arc "shoot" straight off the end of the electrode in bullet fashion. This arc force can be directed by pointing the electrode in the direction you want the arc to go. The resultant of the two arc forces and the tendency of the arc to lag behind create the arc blow.

The operator has little control over either, but he does have control over the arc force produced by the electrode coating. If this force is high and the magnetic force is low, direction of the arc can successfully be controlled. If the converse is true the operator has little or no control over arc blow.

Electrodes designed especially with the "soft arc" or for ac operation have very little arc force produced by the coating. Thus the operator has very little control over arc blow. But since the magnetic forces are much less on ac than on dc, the resultant arc blow on ac generally causes no difficulty.

The longer the mechanical arc length the more pronounced the resultant blow is. The coating produces such a long sheath over the ends of "hot" electrodes that the mechanical arc length is long and the resultant arc blow may be great even though arc force is relatively high.

Uniformity of Bead

Most mild steel electrode coatings contain chemicals which break down when the coating becomes hot. This is often accompanied by a change in the arc force or penetration, spatter, undercut, size of droplets, slag removal, shape and porosity of bead.

The degree to which the various changes occur will depend on the coating design and will therefore vary with the different electrodes.

Freedom from Cracking

There is no definite relationship between the ability of weld metal to elongate in an all-weld-metal tensile specimen and its tendency to crack in welding a joint. A

Electrode	Welding Positions	Polarity	RECOMMENDED USE
EXX10	All	Positive	Where good penetration and small amount of slag is important; excellent for multiple pass applications in vertical and overhead positions; radiographic requirements can be met; galvanized steel.
EXX11	All	AC or positive	Same as EXX10.
EXX12	All	Negative or AC	Largest tonnages used in flat and horizontal positions for single-pass, high-speed, high-current fillet welds; good appearance, easy operating, withstands high currents and bridges gaps where fit-up is poor.
EXX13	All	Negative or AC	General production welding as recommended for EXX12; easier operating at low currents and low open-circuit voltages; smoother bead than EXX12; some are made especially for sheet metal; flat fillet shape, easier slag removal.
EXX15	All	Positive	For higher-strength, high-carbon alloy steels; eliminates underbead cracking in welding these steels; high-sulfur free-machining steel and high tensile steels require this; for steels generally considered hard to weld.
EXX16	All	AC or positive	Same as EXX15.
EXX20	Horizontal fillets and flat	AC or negative	For high-speed welding of heavy plate; meets radiographic requirements; high currents usually give high deposition rates on heavy plates; not used on thin plate; known as a "hot rod".
EXX24	Horizontal fillets and flat	AC or DC	Principally for fillet welds on mild steel; welds are slightly convex in profile, with a very smooth surface and extremely fine ripple approaching the appearance of an automatic weld; smooth, quiet arc; very low spatter; low penetration and is operable at high lineal speeds; a drag type electrode.
EXX27	Horizontal fillets and flat	AC or DC	Well suited for the welding of heavy sections; flat to slightly concave profile; easily passes most rigid radiographic requirements; smooth, fine ripple and good metal wash-up on sides of fillet; current ranges for various diameters are higher than for all other classifications.
EXX30	Flat only	AC or positive	Deep-groove welding in heavy plate in the flat position only.

concave bead shape does exhibit the greatest cracking tendency, so long arcs or weaving techniques which might produce concave beads should be avoided when cracking is encountered.

Freedom from Surface Holes

The statement, "the greater the tendency for surface holes, the less tendency for internal holes," while true, must be made with reservations. Improvements in some electrodes (the EXX15-16, for instance) have practically eliminated external holes yet the welds remain free of internal porosity.

Freedom from Sticking

As a general rule, the higher the current used on a particular electrode the less tendency it has to stick. For a given current there is generally less sticking with dc than with ac current. When an electrode is designed specifically for dc it may tend to stick on ac operation. If the current is raised high enough to prevent sticking, the coating may break down making it impossible to use the full electrode length. Some electrodes designed specifically for ac are slow when used on dc operation . . . slower than those designed for dc.

To have satisfactory stability for a given type of electrode, an industrial machine must be capable of producing an arc which will not pop-out under normal welding conditions. On limited-input machines some special electrodes might be considered satisfactory even though the arc popped-out once or twice in each electrode.

Rating of machine stability is based on the minimum open circuit voltage on which the electrode will satisfactorily operate. The following table lists the open circuit voltages corresponding to the ratings on the chart.

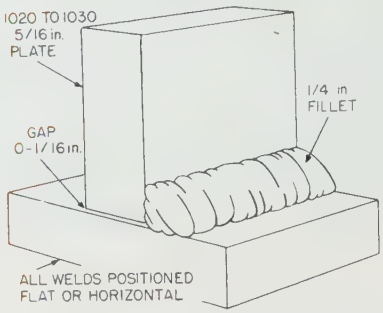
Machine Stability Required	Minimum machine open circuit voltage for stable operation (approximate)
High	d-c machine (or a-c machine with 80 v or higher)
Medium high	70 v
Medium	60 v
Medium low	55 v
Low	45 v or less

• *Extra copies of this article and the electrode buyers guide on page 142 are available in quantities from one to three until supply is exhausted. Write Editorial Department, STEEL, Penton Bldg., Cleveland 13, O.*

How to Choose the Right Electrode

It's a matter of matching electrode characteristics with job requirements

Example 1.—Flat and Horizontal Position Fillets



Job Requirements

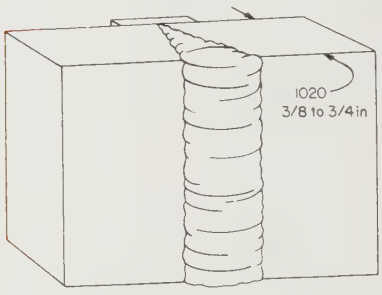
1. Most economical weld . . . competitive situation
2. Good weld appearance
3. Clean welds—easy slag removal—no spatter on weldment
4. Analysis good to fair — welds free of cracks—some 1035 be used
5. Ac welding equipment

Using the Chart

1. Take Job Requirement No. 1. Find characteristic that affects it most —in this case Deposition Rate. All electrodes with good deposition rates get a checkmark.
2. Repeat this procedure with the other four job requirements. On completion, chart will resemble the one at right.
3. Then read down the vertical columns on the chart. The electrode that has all check marks is the best choice for the job.

								EXX 24	
● 5 — 1	X	✓	✓	✓	X	✓	✓	✓	✓
2	X	X	X	X	X	X	✓	✓	✓
● 1 — 3									
4									
5									
6									
7									
8									
9									
10									
11	✓	X	X	✓	X	X	✓	✓	✓
12									
13									
● 4 — 14	X	X	✓	X	✓	✓	X	✓	X
15									
● 3 — 16	X	X	X	✓	X	X	✓	✓	✓
17									
18									
19									
20									
21									
22									
● 2 — 23	X	X	X	X	X	X	✓	✓	✓

Example 2.—Vertical and Horizontal Butt Welds



Job Requirements

1. X-ray quality required
2. Ac welding equipment
3. All-position welding
   a. Flat head easiest to han and most economical
   b. Minimum slag interferenc

Using the Chart

Follow same procedure as in Example 1. Note in this case (see schematic) that Requirement No. 3 is affected by three categories on the characteristics chart . . . Gaseous Shield Bead Shape and Weld Appearance.

Those electrode characteristics which apply to the two example problems have been underlined on the chart (p. 141). For further identification, the lines marked with black dots apply to Example 1 and those with stars refer to Example 2.

		EXX 11							
☆ 2 — 1	X	✓	✓	✓	✓	X	✓	✓	✓
2									
3									
4									
5	✓	✓	X	X	X	X	X	X	X
6									
7	✓	✓	X	✓	✓	✓	X	✓	X
☆ 1 — 8	✓	✓	X	✓	✓	✓	✓	✓	✓
9									
10	✓	✓	X	X	X	X	X	X	X
11									
☆ 3 — 12									
13									
14									
15									
16									
17									
18									
19									
20									
21	✓	✓	X	X	X	X	X	X	X
22									
23									

Electrode Characteristics

Coating Type	High Organic		High Rutile		High Mineral					
							High Iron Oxide			
Electrode AWS Class	High Cellulose Sodium EXX10	High Cellulose Potassium EXX11	High Titania Sodium EXX12	High Titania Potassium EXX13	Sodium EXX15	Potassium EXX16	EXX20	EXX24	EXX27	EXX30
Polarity	(+)	AC or (+)	(−) or AC	(−) or AC	(+)	AC or DC+	AC or —	AC or DC	AC or DC	AC or
Penetration w. norm. curr.	High	Medium High	Medium Low	Medium Low	Medium High	Medium High	Medium	Low	Low	Medium High
Deposition rate w. norm. curr.	Low	Low	Medium High	Medium	Medium	Medium	High	Very High	Very High	High
Size of droplets w. Low amp.	Medium	Medium	Large	Large	Large	Large	Fine	Fine	Fine	Medium fine
w. High amp.	Medium	Medium	Large	Large	Large	Large	Fine	Fine	Fine	Medium fine
Gaseous shield	High	High	Medium Low	Medium	Low	Low	Low	Low	Low	Low
Rate of slag solidification	High	Medium High	Medium	Medium	Medium	Medium	Low	Medium	Low	Low
Normal bead w. shape	Flat	Flat to convex	Convex	Flat to convex	Flat to convex	Flat to convex	Flat to concave	Flat to convex	Flat to concave	Flat to concave
Freedom from porosity (x-ray)	Medium High	Medium High	Low	Medium	High	High	High	High	High	High
Arc blow stability (dc)	High	Medium	High	Medium	Medium	Medium	Low	High	Low	Medium Low
Versatility (all position operation)	High	High	Medium	Medium High	Medium High	Medium High	Low	Low	Low	Low
Ease of slag removal Bulk	High	Medium	Medium High	High	Medium	Medium	High	High	High	High
At Edge	Low	Low	Medium High	High	High	Medium	Medium	High	High	Medium
Uniformity of bead from start to finish	High	High	Medium Low	Medium	High	High	High	High	High	High
Freedom from undercutting	Low	Low	Medium High	High	Medium High	Medium High	Medium High	Medium	Medium	Medium
Freedom from cracking	Medium	Medium	High	Medium Low	High	High	Medium Low	High	Medium High	Medium
Freedom from surface holes	Medium Low	Medium	High	Medium High	High	High	Medium	High	High	Medium Low
Freedom from spatter	Low	Low	Medium	High	Medium	Medium	High	High	High	Medium High
Ease of operator training	Low	Low	Medium High	High	Medium	Medium	Medium	High	High	Medium
Flash-in	Low	Low	Medium Low	Medium High	Medium	Medium	High	High	High	High
Machine stability required	High	Medium	Medium	Low	High	Medium High	Medium	Medium	Medium	Medium
Freedom from electrode sticking	Medium High	Medium High	Medium Low	Medium High	High	High	High	High	High	High
Freedom from slag interference	High	High	Medium High	Medium	Medium Low	Medium Low	Low	Low	Low	Low
Volume of molten slag	Low	Low	Medium	Medium High	High	High	High	High	High	High
Solid appearance	Low	Low	Medium	Medium High	Medium Low	Medium Low	High	High	High	High

STEEL's

Arc Welding Electrode Buyers Guid

Here are the latest tradename designations for the five major categories of electrodes. There are many other special-purpose electrodes that have not been standardized by AWS and ASTM specifications. Consult the manufacturers for their application details

• *Extra copies of this article are available in quantities from one to three until supply is exhausted. Write Editorial Department,* STEEL, *Penton Bldg., Cleveland* 13, *O.*

STAINLESS STEEL

ASTM-AWS Specifications No.	Current	Air Reduction Sales Co.	Alloy Rods Co.	All-State Welding Alloys Co.	Arcos Corp.	Champion Rivet Co.	General Electric Co.	Harnischfeger Corp.	Hoba Bros.
E-307-15	dc	.....	.....	.....	.....	.....	.....	AW3C-L	.....
E-307-16	ac or dc	.....	.....	.....	.....	.....	.....	AW3C-T	.....
E-308-15	dc	Airco 19-9	Arcoloy 308 Lime	.....	Chromend K	308-1	W-1308	Harstain 18-8 also in ELC	No. 30
E-308-16	ac or dc	Airco 19-9	Arcoloy 308 ac-dc	All-State No. 188	Stainlend K	308-2	W-2308	Harstain A18-8 also in ELC	No. 30 ac
E-309-15	dc	Airco 2512	Arcoloy 309 Lime	.....	Chromend HC	309-1	W-1309	Harstain 25-12	No. 30
E-309-16	ac or dc	Airco 25-12	Arcoloy 309 ac-dc	.....	Stainlend HC	309-2	W-2309	Harstain A25-12	No. 30 dc
E-310-15	dc	Airco 25-20	Arcoloy 310 Lime	.....	Chromend HCN	310-1	W-1310	Harstain 25-20	No. 31
E-310-16	ac or dc	Airco 25-20	Arcoloy 310 ac-dc	All-State No. 252	Stainlend HCN	310-2	W-2310	Harstain A25-20	No. 31 ac
E-316-15	dc	Airco 18-12 Mo	Arcoloy 316 Lime	.....	Chromend K Mo	316-1	W-1316	Harstain 18-8, 2 Mo also in ELC	No. 31
E-316-16	ac or dc	Airco 18-12 Mo	Arcoloy 316 ac-dc	.....	Stainlend K Mo	316-2	W-2316	Harstain A18-8, 2 Mo also in ELC	No. 31 ac
E-317-15	dc	Airco 18-12 3.5 Mo	Arcoloy 317 Lime	.....	Chromend 18/8 Mo	317-1	W-1317	Harstain 18-8, 3 Mo	.....
E-317-16	ac or dc	Airco 18-12 3.5 Mo	Arcoloy 317 ac-dc	.....	.....	317-2	W-2317	.....	.....
E-318-15	dc	.....	.....	.....	.....	.....	.....	.....	.....
E-330-15	dc	Airco 35 Ni 15 Cr	Arcoloy 330 Lime	.....	Chromend 15/35	330-1	W-1330	.....	.....
E-330-16	dc or ac	Airco 35 Ni 15 Cr	Arcoloy 330 ac-dc	.....	.....	330-2	W-2330	.....	.....
E-347-15	dc	Airco 19-9 Cb	Arcoloy 347 Lime	.....	Chromend 19/9 Cb	347-1	W-1347	Harstain 18-8, Cb	No. 34
E-347-16	dc or ac	Airco 19-9 Cb	Arcoloy 347 ac-dc	.....	Stainlend 19/9 Cb	347-2	W-2347	Harstain A18-8, Cb	No. 34 ac
E-410-15	dc	Airco 12 Cr	Arcoloy 410 Lime	.....	Chromend 12	410-1	W-1410	.....	.....
E-410-16	dc or ac	Airco 12 Cr	Arcoloy 410 ac-dc	.....	.....	410-2	W-2410	.....	.....
E-430-15	dc	Airco 16 Cr	Arcoloy 430 Lime	.....	Chromend 16	430-1	W-1430	.....	.....
E-430-16	dc or ac	.....	Arcoloy 430 ac-dc	.....	.....	430-2	.....	.....	.....
E-502-15	dc	Airco 4-6 Cr Mo	Arcoloy 502 Lime	.....	.....	Croloy 5 A	W-1502	.....	.....
E-502-16	dc or ac	.....	Arcoloy 502 ac-dc	.....	.....	502-2	W-2502	Harchrome 5	.....

MINUM

-AWS cation o.	Air Reduction Sales Co.	All-State Welding Alloys Co.	Arcos Corp.	Champion Rivet Co.	Hobart Bros. Co.	Lincoln Electric Co.	Marquette Mfg. Co.	Metal & Thermit Corp.	National Cylinder Gas Co.
	.....	All-State 2S Coated	Alumend 2S	Type Al-2	.....	.....	.....	Murex Type Al-2S	.....
	Al-43 Airco 57	All-State No. 32	Alumend 43S	Type Al-43	Hobart Aluminum	Aluminum-weld	Marquette No. 70	Murex Type Al-43	Sureweld 1217-C

PPER

-AWS bol	E-Cu	E-Cu Sn A	E-Cu Sn C	E-Cu Ni	E-Cu Si	E-Cu Al A	E-Cu Al B	E-Cu Al C	E-Cu Al D	E-Cu Al E
eduction s Co.	.....	Airco 70	.....	.....	.....	Airco 100	Airco 116	Airco 120	Airco 125	Airco 130
Rods Co.	.....	.....	Bronze-Arc C	.....	.....	.....	.....	.....	.....	.....
ate Welding ys Co.	.....	.....	All-State No. 24	.....	.....	.....	.....	.....	.....	.....
Metal Inc.	.....	.....	Phos-Trode	.....	.....	Ampco-Trode 10	Ampco-Trode 160	Ampco-Trode 200	Ampco-Trode 250	Ampco-Trode 300
Corp.	.....	.....	.....	Nicuend	.....	.....	.....	.....	.....	.....
pion Rivet	.....	.....	Bronze Devil	.....	.....	.....	.....	.....	.....	.....
t Bros. Co.	.....	.....	Hobart Arcbronz	.....	.....	.....	.....	.....	.....	.....
n Electric Co.	.....	.....	Aerisweld	.....	.....	.....	.....	.....	.....	.....
ette Mfg. Co.	.....	.....	.....	.....	Marquette No. 61	.....	.....	.....	.....	.....
& Thermit o.	.....	.....	Murex Pb-57	.....	.....	Murex Ab-12	Murex AB-16	Murex AB-20	Murex AB-25	Murex AB-30
nal Cylinder Co.	.....	Sureweld –20 Sureweld –22 Sureweld –20B	.....	.....	.....	.....	.....	.....	.....	.....
Avery Co.	.....	.....	Racolloy Phosphor-Bronze	.....	.....	.....	.....	.....	.....	.....

I-AWS cations o.	Lincoln Electric Co.	Marquette Mfg. Co.	Maurath, Inc.	McKay Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	Reid-Avery Co.	A. O. Smith Corp.	Westinghouse Electric Corp.
-15	.....	.....	.....	.....	.....	.....	.....	SW 164	.....
-16	.....	.....	.....	.....	.....	.....	.....	.....	.....
-15	Stainweld A-5	.....	Maurath Type 308	McKay 18-8	Murex 19-9	Sureweld 308-15	Racolloy 18-8	SW 162 SW 262	308-15 Lime
-16	Stainweld A-7	Marquette 308	Maurath Type 308	McKay 18-8	Murex Type 308	Sureweld 308-16	Racolloy 18-8 ac-dc	SW 362	308-16 Titania
-15	Stainweld B-Cb	.....	Maurath Type 309	McKay 25-12	Murex 25-12	Sureweld 309-15	Racolloy 25-12	SW 166 SW 167	309-15 Lime
-16	.....	Marquette 309	Maurath Type 309	McKay 25-12	Murex Type 309	Sureweld 309-16	Racolloy 25-12 ac-dc	.....	309-16 Titania
-15	Stainweld D	.....	Maurath Type 310	McKay 25-20	Murex 25-20	Sureweld 310-15	Racolloy 2520	SW 159, SW 169, SW 168, SW 173	310-15 Lime
-16	.....	Marquette 310	Maurath Type 310	McKay 25-20	Murex Type 310	Sureweld 310-16	Racolloy 2520 ac-dc	SW 359 SW 368	310-16 Titania
-15	.....	.....	Maurath Type 316	McKay 18-8 Mo (316)	Murex 18-8 Mo	Sureweld 316-15	Racolloy 18-12	SW 160 SW 260	316-16 Lime
-16	.....	Marquette 316	Maurath Type 316	McKay 18-8 Mo (316)	Murex Type 316	Sureweld 316-16	Racolloy 18-12 ac-dc	.....	316-16 Titania
-15	.....	.....	Maurath Type 317	McKay 18-8 (317)	Murex 18-8 3 Mo	Sureweld 317-15	Racolloy 18-12	SW 161	317-15 Lime
-16	.....	Marquette 317	Maurath Type 317	McKay 18-8 (317)	Murex Type 317	Sureweld 317-16	Racolloy 18-12 ac-dc	.....	317-16 Titania
-15	Stainweld C-Cb	.....	.....	.....	.....	.....	.....	SW 158	.....
-15	.....	.....	Maurath Type 330	McKay 15-35	Murex 15-35	Sureweld 330-15	Racolloy 15-35	.....	330-15 Lime
-16	.....	Marquette 330	Maurath Type 330	McKay 15-35	Murex Type 330	Sureweld 330-16	Racolloy 15-35 ac-dc	.....	.....
-15	Stainweld A5-Cb	.....	Maurath Type 347	McKay 18-8 Cb	Murex 19-9 Cb	Sureweld 347-15	Racolloy 18-8 Cb	SW 157	347-15 Lime
-16	Stainweld A7-Cb	Marquette 347	Maurath Type 347	McKay 18-8 Cb	Murex Type 347	Sureweld 347-16	Racolloy 18-8 Cb, ac-dc	SW 357	347-16 Titania
-15	.....	.....	Maurath Type 410	McKay 12 Cr	Murex 12 Cr	Sureweld 410-15	Racolloy 12 Cr-Mo	SW 153	410 Lime
-16	.....	Marquette 410	Maurath Type 410	McKay 12 Cr	Murex Type 410	Sureweld 410-16	Racolloy 12 Cr-Mo, ac-dc	.....	410-16 Titania
-15	.....	.....	Maurath Type 430	McKay 16 Cr	Murex 16 Cr	Sureweld 430-15	Racolloy 16 Cr	.....	430 Lime
-16	.....	Marquette 430	Maurath Type 430	McKay 16 Cr	Murex Type 430	Sureweld 430-16	Racolloy 16 Cr, ac-dc	.....	430-16
-15	.....	.....	Maurath Type 502	McKay 5 Cr-Mo	Murex 4-6 Cr	Sureweld 502-15	Racolloy 5 Cr-Mo	SW 151	502 Lime
-16	.....	.....	Maurath Type 502	McKay 5 Cr-Mo	Murex Type 502	Sureweld 502-16	Racolloy 5 Cr-Mo ac-dc	.....	502-16 Titania

MILD STEEL

ASTM-AWS Specification No.	Electrode Coating	Welding Position	Air Reduction Sales Co.	Alloy Rods Co.	All-State Welding Alloys Co.	Champion Rivet Co.	General Electric Co.	Harnischfeger Corp.	Hoba Bros.
E-4510	Sulcoated or Light Coated	F,V,OH,H	Airco 41, 63	.....	.....	Salcoat	F, L	Washcote	Sulkot
E-4520	Sulcoated or Light Coated	H-Fillets, F	.....	.....	.....	Speed #44	.....	.....	.....
E-6010	High Cellulose Sodium	F,V,OH,H	Airco 78 E	.....	All-State No. 613	Blue Devil	W-610A, B	AP, APV	No. 10
E-6011	High Cellulose Potassium	F,V,OH,H	Airco 230	.....	All-State No. 613	Bluedac	W-611A	AC-1	No. 33
E-6012	High Titania Sodium	F,V,OH,H	Airco 323, 387	.....	All-State No. 613	Gray Devil Gray Devil #2	W-612 A, B, G	PF, PFA	No. 12 No. 77
E-6013	High Titania Potassium	F,V,OH,H	Airco 90, 90A	.....	All-State No. 613	Graydac Tan Devil	W-613A	AC-3, SM	No. 44 No. 31 No. 13
E-6014	High Titania (Iron Powder)	F,V,OH,H	.....	.....	.....	Speedemon 14	.....	DH-6	.....
E-6015	Low Hydrogen Sodium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-6016	Low Hydrogen Potassium	F,V,OH,H	Airco 312	Atom Arc 7016 Iron Powder	.....	.....	W-616A	70LA-1	.....
E-6020	High Iron Oxide	H-Fillets, F	Airco 315, 306, 81	.....	.....	Black Devil	W-620 A, B, C	DH-2, DH-3	No. 11
E-6024	High Iron Oxide (Iron Powder)	H-Fillets, F	.....	.....	.....	Speedemon 24	Strikeasy 1	DH-5	"Rocke 24
E-6027	High Iron Oxide (Iron Powder)	H-Fillets, F	.....	.....	.....	.....	.....	.....	"Rocke 27
E-6030	High Iron Oxide	F	.....	.....	.....	Red Devil	.....	.....	.....

LOW ALLOY STEEL

ASTM-AWS Specification No.	Electrode Coating	Welding Position	Air Reduction Sales Co.	Alloy Rods Co.	All-State Welding Alloys Co.	Arcos Corp.	Champion Rivet Co.	General Electric Co.	Harnischfe Corp.
E-7010	High Cellulose Sodium	F,V,OH,H	Airco 93	.....	.....	.....	Blue Devil 85	W-710A	CM-50
E-7011	High Cellulose Potassium	F,V,OH,H	Airco 382	.....	.....	.....	.....	W-711A	CM-50-1
E-7013	High Titania Potassium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-7015	Low Hydrogen Sodium	F,V,OH,H	.....	.....	.....	.....	Croloy 1A	.....	.....
E-7016	Low Hydrogen Potassium	F,V,OH,H	Airco 327	Atom Arc 7016 Iron Powder	All-State No. 616	Tensilend 70	Hy-Lo	W-716B	70-LA-2 70LB P & H .25 DH-170 (Iron Pow
E-7020	High Iron Oxide	H-Fillets, F	Airco 94	.....	.....	.....	Black Devil 75	W-720A	CM-50-2
E-8010	High Cellulose Sodium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-8011	High Cellulose Potassium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-8015	Low Hydrogen Sodium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-8016	Low Hydrogen Potassium	F,V,OH,H	Airco 396, 354	Atom Arc 8016 N 8016 CM Iron Power	.....	Tensilend 80	.....	W-816A	P&H 8 75 LP
E-8016-B2	Low Hydrogen Potassium	F,V,OH,H	.....	.....	.....	Chromend 1 M	.....	.....	.....
E-8016-C1	Low Hydrogen Potassium	F,V,OH,H	.....	.....	.....	Nickend 2	.....	.....	.....
E-8016-C2	Low Hydrogen Potassium	F,V,OH,H	.....	.....	.....	Nickend 3	.....	.....	.....
E-8020	High Iron Oxide	H-Fillets, F	.....	.....	.....	.....	.....	.....	.....
E-9010	High Cellulose Sodium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-9010-B2	High Cellulose Sodium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-9011	High Cellulose Potassium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-9013	High Titania Potassium	F,V,OH,H	.....	.....	.....	.....	.....	.....	.....
E-9015	Low Hydrogen Sodium	F,V,OH,H	.....	.....	.....	Manganend 1 M	Croloy 2A Croloy 2¼ A	.....	.....
E-9015-B3	Low Hydrogen Sodium	F,V,OH,H	.....	.....	.....	Chromend 2 M	.....	.....	.....
E-9016	Low Hydrogen Potassium	F,V,OH,H	Airco 351	Atom Arc 9016 CM Iron Powder	.....	.....	.....	W-916A	80 LE 90 LE AW 2B P&H 7 P&H .40C
E-9016-B3	Low Hydrogen Potassium	F,V,OH,H	.....	.....	.....	Chromend 2 MA	.....	.....	.....
E-10013	High Titania Potassium	F,V,OH,H	Airco 190	.....	.....	.....	Chromoloy 10013	W-1013A	AW-4
E-10015	Low Hydrogen Sodium	F,V,OH,H	.....	.....	.....	.....	Hy-Lo 230-D	.....	.....
E-10016	Low Hydrogen Potassium	F,V,OH,H	Airco 394, 353	Atom Arc 10016 MM Iron Powder	.....	Tensilend 100	.....	W-1016A, B, C	P&H 12-2 90 LH-2
E-12015	Low Hydrogen Sodium	F,V,OH,H	Airco 352	.....	.....	Tensilend 120	.....	W-1215A	P&H 17-1
E-12016	Potassium	F,V,OH,H	.....	Atom Arc 12016 NMV Iron Powder	.....	.....	.....	.....	.....
E-12020	High Iron Oxide	H-Fillets, F	.....	.....	.....	.....	.....	.....	.....

M-AWS ification No.	Lincoln Electric Co.	Marquette Mfg. Co.	McKay Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	Reid-Avery Co.	A. O. Smith Corp.	Westinghouse Electric Corp.
510	Stable-Arc	Marquette 101	McKay 21		Sureweld 30-S	RACO Blue Label		Sulcoat 18
520			McKay 3		Sureweld 30XL	RACO Type D		
010	Fleetweld 5 Fleetweld 5p Lightweld	Marquette 105	McKay 15	Murex Type R	Sureweld B	RACO 7	SW 10	XL-610
011	Fleetweld 180, 35	Marquette 130 Red-Rod	McKay 11	Murex Type A	Sureweld CB	RACO 11	SW 14	ACP
012	Fleetweld 7, 72	Marquette 120	McKay 17, 116	Murex N-13, Murex Genex, Murex Genex M	Sureweld N, NM, G	RACO 8	SW 11, 12, 17	FP FP-2
013	Fleetweld 47,37 Planeweld 2	Marquette 140, 151, 60, 13	McKay 24	Murex Alternex Murex Type U	Sureweld C, CE, CN	RACO 13	SW 15, 16	SW SW-2
014							SW 46	
015	Shield-Arc LH 70		Pluralloy 70			RACO 6015		
016	Shield-Arc LH 70		Pluralloy 70 AC	Murex Type HTS		RACO 6016	SW 64, 65, 47	LOH-2
020	Fleetweld 11	Marquette 115	McKay 16	Murex FHP Murex D	Sureweld FD	RACO 20	SW 35	DH
024	Jetweld 1	Marquette 12	Comet-Arc				SW 44	Zip-24 Iron Powder
027	Jetweld 2						SW 45	Zip-27 Iron Powder
030	Fleetweld 11		McKay 18					

M-AWS ification No.	Hobart Bros. Co.	Lincoln Electric Co.	Marquette Mfg. Co.	McKay Co.	Metal & Thermit Corp.	National Cylinder Gas Co.	Reid-Avery Co.	A. O. Smith Corp.	Westinghouse Electric Corp.
010	No. 885	Shield-Arc 85 Shield-Arc 85P			Murex Molex	Sureweld MLY-50	RACO 74	SW 75, 80	AP-MO
011					Murex Type MA	Sureweld MLY-C	RACO 7011		ACP-MO
013								SW 85	
015		Shield-Arc LH 70		Pluralloy 70			RACO 180-15		
016	No. 16	Shield-Arc LH 70	Marquette 7016, 7016N	Pluralloy 70 AC	Murex Type HTS-180 Type HTS-80	Sureweld 7016	RACO 180-16	SW 84	LOH-2
020	No. 111HT	Jetweld 2HT Fleetweld 11HT			Murex Type DM	Sureweld MLY-A	RACO 64	SW 76	DH-MO
010									
011			Marquette 85						
015				Pluralloy 3½% Ni					
016					Murex Type 8016 Q		RACO 8016	SW 79, 81	LOH-B-1
016-B2									
016-C1									
016-C2	No. 816 N								
020									
010								SW 95	
010-B2		Shield-Arc 90 CM							
011					Murex Type 2111				
013									
015									
015-B3									
016					Murex Type 2116	Sureweld 9016	RACO 9016	SW 89, 90	LOH-B-2
016-B3	No. 916 CM								
0013		Planeweld 1	Marquette 110				RACO 10013	SW 88	
0015				Pluralloy 100			RACO 230-15		
0016	No. 1016 MM			Pluralloy 100 AC	Murex Type 4216 Type HTS 30 Type AWL		RACO 230-16	SW 100	LOH-B-3
2015				Pluralloy 120	Murex Type HTS-260		RACO 260-15		
2016								SW 120 (dc only)	
2020								SW 101	

STAINLESS STEELS

HEAT-RESISTANT STEELS

ALLOY STEELS

H-STEELS

ALUMINUM

ALUMINUM CASTINGS

COPPER

COPPER CASTINGS

MAGNESIUM

ZINC DIECASTINGS

FERROUS CASTINGS

TITANIUM

Management and Materials

Cost-conscious management rates materials as important to profits as production and sales. No wonder. Materials can represent from 70 to 80 per cent of total product costs. Often they are the biggest single item of cost.

The question of selection is complicated by increasing competition among materials for practically any application. Management's interest in the over-all problem is clear. It must be assured that the right metals for the job are selected, specified and purchased in the most economical forms.

542 metals

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ALLOY STEELS

Chemical Composition Ranges and Limits Include Standard, Tentative Standard (TS) and Boron H-Steels

AISI Number	C	Mn	P Max	S Max	Si	Ni	Cr	Mo
[illegible]	[illegible]	1.60-1.90	0.040	0.040	0.20-0.35	....	....	....
[illegible]	[illegible]	1.60-1.90	0.040	0.040	0.20-0.35	....	....	....
[illegible]	[illegible]	1.60-1.90	0.040	0.040	0.20-0.35	....	....	....
[illegible]	[illegible]	[illegible]	0.040	0.040	0.20-0.35	....	....	....
[illegible]	[illegible]	[illegible]	....	....	0.20-0.35	....	....	....
[illegible]	[illegible]	[illegible]	....	....	0.20-0.35	....	....	....
[illegible]	[illegible]	0.40-0.60	0.040	0.040	0.20-0.35	3.25-3.75	....	....
[illegible]	[illegible]	0.40-0.60	0.040	0.040	0.20-0.35	4.75-5.25	....	....
[illegible]	[illegible]	0.45-0.60	0.025	0.025	0.20-0.35	4.75-5.25	....	....
[illegible]	[illegible]	0.60-0.80	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	....
[illegible]130	0.28-0.33	0.60-0.80	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	....
[illegible]135	0.33-0.38	0.60-0.80	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	....
[illegible]140	0.38-0.43	0.70-0.90	0.040	0.040	0.20-0.35	1.10-1.40	0.55-0.75	....
[illegible]	0.08-0.13	0.45-0.60	0.025	0.025	0.20-0.35	3.25-3.75	1.40-1.75	....
[illegible]	0.14-0.19	0.45-0.60	0.025	0.025	0.20-0.35	3.25-3.75	1.40-1.75	....
[illegible]	[illegible]	0.70-0.90	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	[illegible]	0.70-0.90	0.040	0.035-0.050	0.20-0.35	....	....	0.20-0.30
[illegible]	0.25-0.30	0.70-0.90	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.25-0.30	0.70-0.90	0.040	0.035-0.050	0.20-0.35	....	....	0.20-0.30
[illegible]	0.30-0.35	0.70-0.90	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.35-0.40	0.70-0.90	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.40-0.45	0.70-0.90	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.45-0.50	0.70-0.90	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.50-0.56	0.75-1.00	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.60-0.67	0.75-1.00	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.63-0.70	0.75-1.00	0.040	0.040	0.20-0.35	....	....	0.20-0.30
[illegible]	0.18-0.23	0.70-0.90	0.040	0.040	0.20-0.35	....	0.40-0.60	0.08-0.15
[illegible]	0.28-0.33	0.40-0.60	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	[illegible]	0.45-0.65	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
[illegible]	[illegible]	0.45-0.65	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
[illegible]	[illegible]	0.70-0.90	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	[illegible]	0.70-0.90	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	0.35-0.40	0.75-1.00	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
[illegible]	0.38-0.43	0.75-1.00	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	0.38-0.43	0.80-1.05	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
[illegible]	0.40-0.45	0.75-1.00	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	0.40-0.45	0.80-1.05	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
[illegible]	0.43-0.48	0.75-1.00	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	0.43-0.48	0.80-1.05	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
[illegible]	0.45-0.50	0.75-1.00	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	0.48-0.53	0.75-1.00	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15-0.25
[illegible]	0.48-0.53	0.80-1.05	....	....	0.20-0.35	....	0.90-1.20	0.08-0.15
				V				
[illegible]43BV12	0.08-0.13	0.75-1.00		0.03 min	0.20-0.40	1.65-2.00	0.40-0.60	0.20-0.30
[illegible]BV14	0.10-0.15	0.15-0.65	...	0.03 min	0.20-0.35	1.65-2.00	0.40-0.60	0.08-0.15
				S				
[illegible]	[illegible]	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	0.40-0.60	0.20-0.30
[illegible]	[illegible]	0.60-0.80	0.040	0.040	0.20-0.35	1.65-2.00	0.70-0.90	0.20-0.30
[illegible]	[illegible]	0.65-0.85	0.025	0.025	0.20-0.35	1.65-2.00	0.70-0.90	0.20-0.30
[illegible]	0.38-0.43	0.60-0.80	0.040	0.040	0.20-0.35	1.65-2.00	0.70-0.90	0.20-0.30
[illegible]	0.38-0.43	0.65-0.85	0.025	0.025	0.20-0.35	1.65-2.00	0.70-0.90	0.20-0.30
[illegible]	0.06-0.11	0.25-0.45	0.040	0.040	0.25 max	1.40-1.75	....	0.15-0.25
[illegible]	0.10-0.15	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.13-0.18	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.15-0.20	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.17-0.22	0.45-0.65	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.18-0.23	0.50-0.70	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.18-0.23	0.70-0.90	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.38-0.43	0.60-0.80	0.040	0.040	0.20-0.35	1.65-2.00	....	0.20-0.30
[illegible]	0.17-0.22	0.50-0.70	0.040	0.040	0.20-0.35	0.90-1.20	0.35-0.55	0.15-0.25
[illegible]	0.10-0.15	0.40-0.60	0.040	0.040	0.20-0.35	3.25-3.75	....	0.20-0.30
[illegible]	0.13-0.18	0.40-0.60	0.040	0.040	0.20-0.35	3.25-3.75	....	0.20-0.30
[illegible]	0.15-0.20	0.40-0.60	0.040	0.040	0.20-0.35	3.25-3.75	....	0.20-0.30
[illegible]	0.18-0.23	0.50-0.70	0.040	0.040	0.20-0.35	3.25-3.75	....	0.20-0.30
[illegible]	0.12-0.17	0.30-0.50	0.040	0.040	0.20-0.35	....	0.30-0.50	....
[illegible]	0.27-0.34	0.70-1.00	....	....	0.20-0.35	....	0.35-0.60	....
[illegible]B35 alt.	0.32-0.39	0.70-1.00	....	....	0.20-0.35	....	0.35-0.60	....
[illegible]B40 alt.	0.37-0.45	0.70-1.00	....	....	0.20-0.35	....	0.35-0.60	....
[illegible]B44 alt.	0.42-0.50	0.70-1.00	....	....	0.20-0.35	....	0.35-0.60	....
[illegible]	0.43-0.50	0.75-1.00	0.040	0.040	0.20-0.35	....	0.20-0.35	....
[illegible]	0.43-0.50	0.75-1.00	0.040	0.040	0.20-0.35	....	0.20-0.35	....
[illegible]	0.48-0.53	0.75-1.00	0.040	0.040	0.20-0.35	....	0.40-0.60	....
[illegible]B60	0.55-0.65	0.75-1.00	0.040	0.040	0.20-0.35	....	0.40-0.60	....
[illegible]117	0.15-0.20	0.70-0.90	0.040	0.040	0.20-0.35	....	0.70-0.90	....
[illegible]	0.17-0.22	0.70-0.90	0.040	0.040	0.20-0.35	....	0.70-0.90	....
[illegible]	0.28-0.33	0.70-0.90	0.040	0.040	0.20-0.35	....	0.80-1.10	....
[illegible]	0.30-0.35	0.60-0.80	0.040	0.040	0.20-0.35	...	0.75-1.00	....
[illegible]	0.33-0.38	0.60-0.80	0.040	0.040	0.20-0.35	.....	0.80-1.05	....
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		0.70-0.90	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		0.70-0.90	
[illegible]	[illegible]	0.70-0.95	0.040	0.040	0.20-0.35	....	0.85-1.15	...
5150	0.48-0.53	0.70-0.90	0.040	0.040	0.20-0.35	....	0.70-0.90	....
5152	0.48-0.55	0.70-0.90	0.040	0.040	0.20-0.35	....	0.90-1.20	....
5155	0.50-0.60	0.70-0.90	0.040	0.040	0.20-0.35	....	0.70-0.90	....
5160	0.55-0.65	0.75-1.00	0.040	0.040	0.20-0.35	....	0.70-0.90	....
51B60	0.55-0.65	0.75-1.00	0.040	0.040	0.20-0.35	....	0.70-0.90	....
E50100	0.95-1.10	0.25-0.45	0.025	0.025	0.20-0.35	....	0.40-0.60	....
E51100	0.95-1.10	0.25-0.45	0.025	0.025	0.20-0.35	....	0.90-1.15	....
E52100	0.95-1.10	0.25-0.45	0.025	0.025	0.20-0.35	....	1.30-1.60	....
								V
6117	0.15-0.20	0.70-0.90	0.040	0.040	0.20-0.35	....	0.70-0.90	0.10 min
6120	0.17-0.22	0.70-0.90	0.040	0.040	0.20-0.35	....	0.70-0.90	0.10 min
6145	0.43-0.48	0.70-0.90	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15 min
6150	0.48-0.53	0.70-0.90	0.040	0.040	0.20-0.35	....	0.80-1.10	0.15 min

AISI Number	C	Mn	P Max	S Max	Si	Ni	Cr	Mo
TS 8115	0.13-0.18	0.70-0.90	....	....	0.20-0.35	0.20-0.40	0.30-0.50	0.08-0.15
TS 8120	0.18-0.23	0.70-0.90	....	....	0.20-0.35	0.20-0.40	0.30-0.50	0.08-0.15
TS 8122	0.20-0.25	0.70-0.90	....	....	0.20-0.35	0.20-0.40	0.30-0.50	0.08-0.15
TS 8125	0.23-0.28	0.70-0.90	....	....	0.20-0.35	0.20-0.40	0.30-0.50	0.08-0.15
TS 8127	0.25-0.30	0.70-0.90	....	....	0.20-0.35	0.20-0.40	0.30-0.50	0.08-0.15
81B45	0.43-0.48	0.75-1.00	0.040	0.040	0.20-0.35	0.20-0.40	0.35-0.55	0.08-0.15
8615	0.13-0.18	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
TS 8615	0.13-0.18	0.70-0.90	....	....	0.20-0.35	0.30-0.60	0.55-0.75	0.08-0.15
8617	0.15-0.20	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
TS 8617	0.15-0.20	0.70-0.90	....	....	0.20-0.35	0.30-0.60	0.55-0.75	0.08-0.15
8620	0.18-0.23	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
TS 8620	0.18-0.23	0.70-0.90	....	....	0.20-0.35	0.30-0.60	0.55-0.75	0.08-0.15
8622	0.20-0.25	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8625	0.23-0.28	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8627	0.25-0.30	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8630	0.28-0.33	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8635	0.33-0.38	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8637	0.35-0.40	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8640	0.38-0.43	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8641	0.38-0.43	0.75-1.00	0.040	0.040-0.060	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8642	0.40-0.45	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8645	0.43-0.48	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
86B45	0.43-0.48	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8650	0.48-0.53	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8653	0.50-0.56	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.50-0.80	0.15-0.25
8655	0.50-0.60	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8660	0.55-0.65	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.15-0.25
8715	0.13-0.18	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
8717	0.15-0.20	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
8720	0.18-0.23	0.70-0.90	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
8735	0.33-0.38	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
8740	0.38-0.43	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
8742	0.40-0.45	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
8750	0.48-0.53	0.75-1.00	0.040	0.040	0.20-0.35	0.40-0.70	0.40-0.60	0.20-0.30
9255	0.50-0.60	0.70-0.95	0.040	0.040	1.80-2.20	....	....	....
9260	0.55-0.65	0.70-1.00	0.040	0.040	1.80-2.20	....	....	....
9261	0.55-0.65	0.75-1.00	0.040	0.040	1.80-2.20	....	0.10-0.25	....
9262	0.55-0.65	0.75-1.00	0.040	0.040	1.80-2.20	....	0.25-0.40	....
E9310	0.08-0.13	0.45-0.65	0.025	0.025	0.20-0.35	3.00-3.50	1.00-1.40	0.08-0.15
E9314	0.11-0.17	0.40-0.70	0.025	0.025	0.20-0.35	3.00-3.50	1.00-1.40	0.08-0.15
94B15	0.13-0.18	0.75-1.00	0.040	0.040	0.20-0.35	0.30-0.60	0.30-0.50	0.08-0.15
94B17	0.15-0.20	0.75-1.00	0.040	0.040	0.20-0.35	0.30-0.60	0.30-0.50	0.08-0.15
TS 94B30	0.28-0.33	0.75-1.00	....	....	0.20-0.35	0.30-0.60	0.30-0.50	0.08-0.15
TS 94B40	0.38-0.43	0.75-1.00	....	....	0.20-0.35	0.30-0.60	0.30-0.50	0.08-0.15
9840	0.38-0.43	0.70-0.90	0.040	0.040	0.20-0.35	0.85-1.15	0.70-0.90	0.20-0.30
9845	0.43-0.48	0.70-0.90	0.040	0.040	0.20-0.35	0.85-1.15	0.70-0.90	0.20-0.30
9850	0.48-0.53	0.70-0.90	0.040	0.040	0.20-0.35	0.85-1.15	0.70-0.90	0.20-0.30

Source—American Iron & Steel Institute, 1955

NOTES

1. TS denotes tentative standard steels
2. Boron steels indicated by B can be expected to have 0.0005 per cent minimum boron content
3. Grades with prefix E are manufactured by basic electric furnace process. All others are normally produced by the basic open-hearth process but may be made by the basic electric furnace process with adjustments in phosphorus and sulphur
4. Ranges and limits apply to steel not exceeding 200 sq in. cross-sectional area
5. Compositions apply to following products: Hot-rolled and cold-finished steel bars; semifinished steel products for forging; hot-rolled and cold rolled sheets; hot-rolled and cold-rolled strip; mechanical tubing can be supplied in certain alloy compositions subject to negotiation
6. The phosphorus and sulphur limitations for each process are as follows:
   Basic electric furnace .... 0.025% max
   Basic open hearth .... 0.040% max
   Acid electric furnace .... 0.050% max
   Acid open hearth .... 0.050% max
7. Minimum silicon limit for acid open hearth or acid electric furnace alloy steel is 0.15 per cent
8. Small quantities of certain elements are present in alloy steel which are not specified or required. These elements are considered as incidental and may be present to the following maximum amounts: Copper, 0.35 per cent; nickel, 0.25; chromium, 0.20; molybdenum, 0.06
9. Where minimum and maximum sulphur content is shown, it is indicative of resulphurized steel

ZINC Diecasting Alloys

ASTM, SAE Number and Commercial Name	Composition Limits (ingot) ASTM B240 Tentative Specification	Outstanding Property	Typical Applications
AG40A SAE-903 Zamak-3	Cu 0.10 max; Al 3.9-4.3; Mg 0.03-0.06; Fe 0.075 max; Pb 0.005 max; Cd 0.004 max; Sn 0.002 max	Retention of impact strength and dimensions	Carburetors, fuel pumps, refrigerator hardware, washing machines, parking meters, television and any of below
AC41A SAE-925 Zamak-5	Cu 0.75-1.25; Al 3.9-4.3; Mg 0.03-0.06; Fe 0.075 max; Pb 0.005 max; Cd 0.004 max; Sn 0.002 max	Greater hardness and tensile strength	Business machines, gears, cams hardware, lawn mowers, fans, small tools and any of above

H-STEELS

Chemical Composition Ranges and Limits [illegible]

SAE or AISI NUMBER	C	Mn	Si	Ni	Cr	Mo
1330 H	0.27-0.33	1.45-2.05	0.20-0.35			
1335 H	0.32-0.38	1.45-2.05	0.20-0.35			
1340 H	0.37-0.44	1.45-2.05	0.20-0.35			
TS 14B35 H	0.32-0.38	0.65-1.10	0.20-0.35			
TS 14B50 H	0.47-0.54	0.65-1.10	0.20-0.35			
2515 H	0.12-0.18	0.30-0.70	0.20-0.35	[illegible]		
2517 H	0.14-0.20	0.30-0.70	0.20-0.35	[illegible]		
3120 H	0.17-0.23	0.50-0.90	0.20-0.35	[illegible]-1.45	0.45-[illegible]	
3130 H	0.27-0.33	0.50-0.90	0.20-0.35	[illegible]-1.45	0.45-[illegible]	
3135 H	0.32-0.38	0.50-0.90	0.20-0.35	[illegible]-1.45	0.45-[illegible]	
3140 H	0.37-0.44	0.60-1.00	0.20-0.35	[illegible]-1.45	0.45-[illegible]	
3310 H	0.07-0.13	0.30-0.70	0.20-0.35	[illegible]	1.30-1.80	
3316 H	0.13-0.19	0.30-0.70	0.20-0.35	[illegible]	1.30-1.80	
4032 H	0.29-0.35	0.60-1.00	0.20-0.35			0.20-0.30
4037 H	0.34-0.41	0.60-1.00	0.20-0.35			[illegible]
4042 H	0.39-0.46	0.60-1.00	0.20-0.35			0.20-0.30
4047 H	0.44-0.51	0.60-1.00	0.20-0.35			0.20-0.30
4053 H	0.49-0.56	0.65-1.10	0.20-0.35			0.20-0.30
4063 H	0.59-0.69	0.65-1.10	0.20-0.35			0.20-0.30
4068 H	0.62-0.72	0.65-1.10	0.20-0.35			[illegible]
4118 H	0.17-0.23	0.60-1.00	0.20-0.35		[illegible]	0.08-0.15
4130 H	0.27-0.33	0.30-0.70	0.20-0.35		[illegible]	0.15-0.25
TS 4130 H	0.27-0.33	0.35-0.75	0.20-0.35		[illegible]	[illegible]-0.15
TS 4132 H	0.29-0.35	0.35-0.75	0.20-0.35		[illegible]-1.30	[illegible]-0.15
4135 H	0.32-0.38	0.60-1.00	0.20-0.35		0.75-1.20	0.15-0.25
4137 H	0.34-0.41	0.60-1.00	0.20-0.35		0.75-1.20	0.15-0.25
TS 4137 H	0.34-0.41	0.65-1.10	0.20-0.35		0.85-1.30	0.08-0.15
4140 H	0.37-0.44	0.65-1.10	0.20-0.35		0.75-1.20	0.15-0.25
TS 4140 H	0.37-0.44	0.70-1.20	0.20-0.35		0.85-1.30	0.08-0.15
4142 H	0.39-0.46	0.65-1.10	0.20-0.35		0.75-1.20	0.15-0.25
TS 4142 H	0.39-0.46	0.70-1.20	0.20-0.35		0.85-1.30	0.08-0.15
4145 H	0.42-0.49	0.65-1.10	0.20-0.35		0.75-1.20	0.15-0.25
TS 4145 H	0.42-0.49	0.70-1.20	0.20-0.35		0.85-1.30	0.08-0.15
4147 H	0.44-0.51	0.65-1.10	0.20-0.35		0.75-1.20	0.15-0.25
4150 H	0.47-0.54	0.65-1.10	0.20-0.35		0.75-1.20	0.15-0.25
TS 4150 H	0.47-0.54	0.70-1.20	0.20-0.35		0.85-1.30	0.08-0.15
4320 H	0.17-0.23	0.40-0.70	0.20-0.35	[illegible]	[illegible]-0.65	0.20-0.30
4337 H	0.34-0.41	0.55-0.90	0.20-0.35	[illegible]	[illegible]-0.95	[illegible]-0.30
4340 H	0.37-0.44	0.55-0.90	0.20-0.35	[illegible]	[illegible]-0.95	[illegible]-0.30
E4340 H	0.37-0.44	0.60-0.95	0.20-0.35	[illegible]	[illegible]-0.95	0.20-0.30
46B12 H	0.09-0.15	0.35-0.75	0.20-0.35	[illegible]		0.20-0.30
4620 H	0.17-0.23	0.35-0.75	0.20-0.35	[illegible]		[illegible]-0.30
X4620 H	0.17-0.23	0.40-0.80	0.20-0.35	[illegible]		[illegible]-0.30
4621 H	0.17-0.23	0.60-1.00	0.20-0.35	[illegible]		[illegible]
4640 H	0.37-0.44	0.50-0.90	0.20-0.35	[illegible]		[illegible]
4720 H	0.17-0.23	0.45-0.75	0.20-0.35	[illegible]	0.30-0.60	0.15-[illegible]
4812 H	0.09-0.15	0.30-0.70	0.20-0.35	[illegible]		[illegible]
4815 H	0.12-0.18	0.30-0.70	0.20-0.35	[illegible]		[illegible]
4817 H	0.14-0.20	0.30-0.70	0.20-0.35	3.20-3.80		0.20-0.30
4820 H	0.17-0.23	0.40-0.80	0.20-0.35	3.20-3.80	...	0.20-0.30
5046 H	0.43-0.50	0.65-1.10	0.20-0.35		0.13-0.43	
50B46 H	0.43-0.50	0.65-1.10	0.20-0.35		0.13-0.43	
50B60 H	0.55-0.65	0.65-1.10	0.20-0.35		0.30-0.70	
5120 H	0.17-0.23	0.60-1.00	0.20-0.35		0.60-1.00	
5130 H	0.27-0.33	0.60-1.00	0.20-0.35		0.75-1.20	
5132 H	0.29-0.35	0.50-0.90	0.20-0.35		0.65-1.10	
5135 H	0.32-0.38	0.50-0.90	0.20-0.35		0.70-1.15	
5140 H	0.37-0.44	0.60-1.00	0.20-0.35		0.60-1.00	

SAE or AISI NUMBER [illegible]

Source—Ameri[illegible]

NOTES

1 TS denotes ten[illegible]
2 Boron steels in[illegible]
3 Notes 4, 6, 7 [illegible]
4 Chemical [illegible]
5 X denotes [illegible]

TITANIUM

Material	Producer	Composition (% max)
A 40	Rem-Cru Titanium Inc	99 Ti
RS 40	Republic Steel Corp	C P, 0.20 C
Ti 55A	Titanium Metals Corp	99 Ti 0.12 Fe, 0.05 N_2, 0.10 C
Ti-65A	Titanium Metals Corp	99+ Ti 0.12 Fe, 0.05 N_2, 0.10 C
RS-55	Republic Steel Corp	C P, 0.20 C
A-55	Rem-Cru Titanium Inc	99 Ti 0.20 C
Ti-75A	Titanium Metals Corp	99+ Ti 0.20 Fe, 0.08 N_2, 0.10 C
RS-70	Republic Steel Corp	C P, 0.20 C
A-70	Rem-Cru Titanium Inc	99+ Ti, 0.20 C
MST III	Mallory-Sharon Titanium Corp	99+ Ti, 0.10 C
A-110AT	Rem-Cru Titanium Inc	92 Ti, 5 Al, 2.50 Sn
RS-110A	Republic Steel Corp	7 Mn, 0.20 C
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Ti-140A	Titanium Metals Corp	93+ Ti, 2 Fe, [illegible]
C-120AV	Rem-Cru Titanium Inc	89+ Ti, 6 Al, 4 V
Ti-6Al-4V	Titanium Metals Corp	89+ Ti; 6 Al, 4 V, 0.25 Fe, 0.05 N_2
MST 6 Al 4 V	Mallory-Sharon Titanium Corp	5.50 to 6.50 Al, 3.50 to 4.50 V, 0.20 C
MST 8 Mn	Mallory-Sharon Titanium Corp	92 Ti; 7 to 9 Mn, 0.20 C
C-130AM	Rem-Cru Titanium Inc.	91+ Ti, 4 Mn
RS-130	Republic Steel Corp.	4 Mn, 4 Al, 0.20 C
MST 4 Mn 4 Al	Mallory-Sharon Titanium Corp	3.50 to 4.50 Mn, [illegible]
RS-140X	Republic Steel Corp.	1.25 Fe, 2.75 Cr, 5 Al; 0.20 C
MST 3 Al 5 Cr	Mallory-Sharon Titanium Corp	2.50 to 3.50 Al, 4.50 to 5.50 Cr; 0.20 C
Ti-155A	Titanium Metals Corp.	88+ Ti; 1.30 Fe; 1.40 Cr, 1.40 Mo; 5 Al, 0.05 N_2; 0.10 C

*S- Rolled flat products—sheet, strip, plate
B Bar and billet

Metal Selector

Here is the practical information needed to help you select the right metal for the job

STAINLESS and Heat-Resistant Steels

AISI No.	C	Mn Max	Si Max	Cr	Ni	P Max	S Max	Properties and Applications
201	0.15	5.5-7.5		16-18	3.5-5.5	0.060	0.030	Low-nickel alternate for 301
	Other: N							
202	0.15 max	7.5-10.0	1.00	17-19	4-6	0.060	0.030	Low-nickel alternate for 302
	Other: N 0.25							
301	0.15 max	2.00	1.00	16-18	6-8	0.045	0.030	Rapid work hardening. Railroad cars, trailer bodies, aircraft structurals
302	0.15 max	2.00	1.00	17-19	8-10	0.045	0.030	General-purpose chromium-nickel type. Trim, food handling equipment, jewelry, aircraft cowling, antennas, springs, architectural, cookware (302 clad)
302B	0.15 max	2.00	2-3	17-19	8-10	0.045	0.030	Higher scaling resistance at elevated temperatures than 302. Furnace parts, still liners
303	0.15 max	2.00	1.00	17-19	8-10	0.200	0.15 min	Free machining, lower galling tendency than 302. Screw machine products, shafts, valves
303Se	0.15 max	2.00	1.00	17-19	8-10	0.200	0.06	Somewhat better transverse mechanical properties and slightly lower machinability than 303
	Other: Se 0.15 min							
304	0.08 max	2.00	1.00	18-20	8-12	0.045	0.030	General-purpose alloy for welding. Chemical and food processing equipment, recording wire
304L	0.03 max	2.00	1.00	18-20	8-12	0.045	0.030	Weldments for corrosive conditions where intergranular carbide precipitation must be avoided
305	0.12 max	2.00	1.00	17-19	10-13	0.045	0.030	Low work-hardening rate. Maximum plasticity for forming, spinning and cold heading
308	0.08 max	2.00	1.00	19-21	10-12	0.045	0.030	Welding rod and electrodes
309	0.20 max	2.00	1.00	22-24	12-15	0.045	0.030	High scale resistance and good strength at high temperatures. Aircraft heaters, heat treating equipment, annealing covers, furnace parts
309S	0.08 max	2.00	1.00	22-24	12-15	0.045	0.030	Weldments with high scale resistance
310	0.25 max	2.00	1.50	24-26	19-22	0.045	0.030	Excellent for general use. Hydrogenation tubes, heat exchangers, furnace parts, combustion chambers
310S	0.08 max	2.00	1.50	24-26	19-22	0.045	0.030	Like 309S but has even higher heat resistance
314	0.25 max	2.00	1.5-3	23-26	19-22	0.045	0.030	Highest heat resistance. Uses similar to 310. Resistant to carburizing
316	0.08 max	2.00	1.00	16-18	10-14	0.045	0.030	Higher resistance to corrosives affecting other stainless steels. High creep resistance. High temperature parts, chemical and pulp handling equipment, photographic and food equipment
	Other: Mo 2-3							
316L	0.03 max	2.00	1.00	16-18	10-14	0.045	0.030	Version of 316 for weldments where intergranular carbide precipitation must be avoided. Permits stress relief at 1550-1650° F
	Other: Mo 1.75-2.3							
317	0.08 max	2.00	1.00	18-20	11-15	0.045	0.030	Higher in corrosion resistance than 316
	Other: Mo 3-4							
321	0.08 max	2.00	1.00	17-19	9-12	0.045	0.030	For weldments subject to severely corrosive conditions and service in 800-1650° F range. Aircraft exhaust manifolds, boiler shells, expansion joints, process equipment
	Other: Ti 5xC min							
347	0.08 max	2.00	1.00	17-19	9-13	0.045	0.030	For uses similar to 321. More widely used for welded process equipment
	Other: Cb 10xC min							
348	0.08 max	2.00	1.00	17-19	9-13	0.045	0.030	Equivalent to 347. For atomic energy applications due to low retentivity
	Other: Cb 10xC min, Ta 0.1 max							
403	0.15 max	1.00	0.50	11.5-13	....	0.040	0.030	Steam turbine blades, jet engine compressor blades, highly stressed parts
405	0.08 max	1.00	1.00	11.5-14.5	..	0.040	0.030	Nonhardenable. For welded assemblies where air-hardening of type 410 or 403 is objectionable
	Other: Al 0.10-0.30							
410	0.15 max	1.00	1.00	11.5-13.5	....	0.040	0.030	General-purpose corrosion and heat resistance. Hardenable by heat treatment. Coal screens, low priced cutlery, machine parts, valve trim
414	0.15 max	1.00	1.00	11.5-13.5	1.25-2.5	0.040	0.030	High-strength version of 410. Rules and straight edges, mild springs, scraper knives
416	0.15 max	1.25	1.00	12-14	....	0.060	0.15 min	Free machining. Bolts, nuts and screws, carburetor parts, fishing reels, golf club heads, instrument parts, screw machine parts, valve trim
	Other: Mo 0.60 max, Zr 0.60 max							
416Se	0.15 max	1.25	1.00	12-14	....	0.060	0.060	Slightly higher transverse properties and slightly lower machinability than 416
	Other: Se 0.15 min							
420	Over 0.15	1.00	1.00	12-14	....	0.040	0.030	High hardness from heat treatment. General purpose cutlery grade. Surgical instruments
430	0.12 max	1.00	1.00	14-18	....	0.040	0.030	General-purpose nonhardenable chromium type. Decorative trim, nitric acid tanks, annealing baskets, auto trim, sinks
430F	0.12 max	1.25	1.00	14-18	....	0.060	0.15 min	Free-machining bars. Screw machine parts, screws and other fasteners
	Other: Mo 0.60 max, Zr 0.60 max							
430FSe	0.12 max	1.25	1.00	14-18	....	0.060	0.060	Free machining, retaining forgeability. Fine finish quality. Similar to 430F
	Other: Se 0.15 min							
431	0.20 max	1.00	1.00	15-17	1.25-2.5	0.040	0.030	Special-purpose hardenable type. Aircraft fittings, bolts, paper machinery, windshield wiper arms, heater bars, springs
440A	0.6-0.75	1.00	1.00	16-18	....	0.040	0.030	High strength and corrosion resistance. Hardenable by heat treatment. Toughest high chrome cutlery grade. bearings, seaming rolls, surgical tools
	Other: Mo 0.75 max							
440B	0.75-0.95	1.00	1.00	16-18	....	0.040	0.030	Cutlery grade. Uses similar to 440A
	Other: Mo 0.75 max							
440C	0.95-1.20	1.00	1.00	16-18	....	0.040	0.030	Ball bearing grade. Also bushings, valve parts, cutlery
	Other: Mo 0.75 max							
446	0.20 max	1.50	1.00	23-27	....	0.040	0.030	Resistance to high-temperature scaling, hot sulphur-bearing gases and oxidizing acids
	Other: N 0.25 max							
501	Over 0.1	1.00	1.00	4-6	....	0.040	0.030	Moderate resistance to scaling, but limited corrosion resistance. Oil industry equipment stills, heat exchangers, hot lines
	Other: Mo 0.40-0.65							
502	0.1 max	1.00	1.00	4-6	....	0.040	0.030	Similar uses to 501
	Other: Mo 0.40-0.65							

COPPER Wrought Alloys

Name	Nominal Composition[1]	Forms Used[2]	Machinability[3]	Applications
COPPERS:				
Electrolytic tough pitch	Cu 99.92; O 0.04	R,D,S,W,T	20	Radiators, electrical wire, flashing
Deoxidized	Cu 99.94; P 0.02	R,D,S,T	20	Plumbing, refrigeration, oil lines
Oxygen-free copper	Cu 99.92 min	R,D,S,W,T	20	Electronics, bus bar, radar
BRASSES—Nonleaded:				
Gilding, 95%	Cu 95; Zn 5	R,D,W	20	Medals, bullet jackets, jewelry
Commercial bronze, 90%	Cu 90; Zn 10	R,D,W,T	20	Door knobs, weather stripping, screen
Jewelry bronze, 87.5%	Cu 87.5; Zn 12.5	R,W	30	Slide fasteners, bead chain, plaques
Red brass, 85%	Cu 85; Zn 15	R,D,W,T	30	Fire extinguishers, compacts, plumbing
Low brass, 80%	Cu 80; Zn 20	R,D,W	30	Bellows, musical instruments, dials
Cartridge brass, 70%	Cu 70; Zn 30	R,D,W,T	30	Cartridge cases, springs, eyelets
Yellow brass	Cu 65; Zn 35	R,D,W	30	Lamp fixtures, hinges, screws
Muntz metal	Cu 60; Zn 40	R,D,W,T	40	Condenser plates, brazing rod, trim
LEADED BRASSES:				
Leaded commercial bronze	Cu 89; Pb 1.75; Zn 9.25	D,S	80	Electrical connectors, bolts, hardware
Low-leaded brass (tube)	Cu 66; Pb 0.5; Zn 33.5	T	60	Pump lines, primers, J-bends
Low-leaded brass	Cu 65; Pb 0.5; Zn 34.5	R	60	Sink strainers, butts, watch backs
Medium-leaded brass	Cu 65; Pb 1; Zn 34	R,D,S,W	70	Dials, clock plates, gears, nuts
High-leaded brass (tube)	Cu 66; Pb 1.6; Zn 32.4	T	80	Collars, large hex nuts, bushings
High-leaded brass	Cu 65; Pb 2.0; Zn 33.0	R,D	90	Nuts, gears, clock wheels
Extra-high-leaded brass	Cu 63; Pb 2.5; Zn 34.5	R	100	Nuts, gears, clock wheels
Free-cutting brass	Cu 61.5; Pb 3; Zn 35.5	D,S	100	Nuts, adaptors, gears, pinions
Leaded Muntz metal	Cu 60; Pb 0.6; Zn 39.4	R	60	Condenser tube plates, screening
Free-cutting Muntz metal (tube)	Cu 60; Pb 1; Zn 39	T	70	Collars, large hex nuts, bushings
Forging brass	Cu 60, Pb 2; Zn 38	R,D,S	80	Valve parts, door latches, refrigerator fittings
Architectural bronze	Cu 57; Pb 3; Zn 40	D,S	90	Extruded building trim and hardware
TIN & ALUMINUM BRASSES:				
Inhibited Admiralty	Cu 71; Zn 28; Sn 1	R,W,T	30	Condenser, heat exchanger tubes and plates
Naval brass	Cu 60; Zn 39.25; Sn 0.75	R,D,S,W,T	30	Valve stems, marine uses, propeller shafts
Leaded naval brass	Cu 60; Pb 1.75; Zn 37.5; Sn 0.75	D,S	70	Bolts, nuts, valve parts
Manganese bronze	Cu 58.5; Fe 1; Zn 39.2; Sn 1; Mn 0.3	R,D,S,W	30	Welding rods, pump rods, valve bodies
Aluminum brass	Cu 76; Zn 22; Al 2	T	30	Condenser, heat exchanger tubes
Aluminum bronze, 5%	Cu 95; Al 5	T	20	Condenser, heat exchanger tubes
PHOSPHOR BRONZES (Tin Bronzes):				
Phosphor bronze, 5%	Cu 95; Sn 5	R,D,W,T	20	Bellows, welding rod, electrical switch parts
Phosphor bronze, 8%	Cu 92; Sn 8	R,D,W	20	Electrical switch parts, bushings, springs
Phosphor bronze, 10%	Cu 90; Sn 10	R,D,W	20	Bridge plates, beater bars, springs
Phosphor bronze, 1.25%	Cu 98.75; Sn 1.25; P trace	R	20	Electrical contacts, flexible hose, pole-line hardware
Free-cutting Phosphor Bronze	Cu 88; Pb 4; Zn 4; Sn 4	R,D	80	Bearings, bushings, valve parts
CUPRO-NICKEL & NICKEL SILVERS:				
Cupro-nickel, 30%	Cu 70; Ni 30	R,D,T	20	Condenser and salt water tubing
Cupro-nickel, 10%	Cu 88.7; Fe 1.3; Ni 10	R,T	20	Condenser and salt water tubing
Nickel silver, 65-18	Cu 65; Zn 17; Ni 18	R,D,W	20	Flatware, zippers, hollow ware
Nickel silver, 55-18	Cu 55; Zn 27; Ni 18	R,D,W	30	Electrical springs, diaphragms, electronics
Nickel silver, 65-15	Cu 65; Zn 20; Ni 15	R	20	Camera parts, costume jewelry, name plates
Nickel silver, 65-12	Cu 65; Zn 23; Ni 12	R,W	20	Etching stock, slide fasteners, hollow ware
Nickel silver, 65-10	Cu 65; Zn 25; Ni 10	R,W	20	Screws, flatware, platers' bars
SILICON BRONZES (Copper-Silicon Alloys):				
High-silicon bronze	Cu 96; Si 3	R,D,S,W,T	30	Screws, bolts, pole-line hardware
Low-silicon bronze	Cu 97.7; Si 1.5	R,D,S,W,T	30	Bolts, screws, nuts, rivets

1. Only major elements listed

2. Abbreviations:
R—rolled flat products
D—rod and drawn flat products
S—shapes
W—wire (except flat)
T—tube

3. Basis: Free-cutting brass = 100

FERROUS CASTINGS

GRAY IRON

ASTM Spec. No.	ASTM Class	Tensile Min psi	Heat Treatment *	Min Section in.	Properties and Typical Applications
A-159			2	⅛	Light weight and thin section castings requiring good appearance, where strength is not prime requisite. Specific qualities usually established by sample
A-48	20	20,000	2	⅛	Same as A-190 with minimum tensile requirement. Excellent machinability as annealed
	25	25,000			
	30	30,000	1	⅛	Most commonly used grade for general machinery, valves, light compressor bodies, municipal castings, waterworks equipment. Good mechanical properties with high machinability
	35	35,000			
	40	40,000	1	¼	Machine tools, medium gear blanks, heavy compressors and motor blocks
	50	50,000	1	⅝	Large castings for heavy service, dies, hydraulic cylinders, machine tools, permanent molds, large gears, press frames
	60	60,000	1	½	Unusual strength or wear resistance for large castings with severe service requirements
A-278	40	40,000	3	½	Pressure containing parts, such as heat exchangers, for use up to 650° F
	50	50,000	3	¾	
		60,000	3	1	
A-319	I		2	¼	I: Superior resistance to thermal shock. II: Average resistance to thermal shock; moderate tensile strength. III: High creep and rupture strength. For castings exposed to high temperatures—grate bars, stokers oil still parts, metal and glass molds, melting pots
	II		2	½	
	III		2	1	

NODULAR (S. G. or Ductile) IRON

ASTM Spec. No.	ASTM No.	Tensile Min psi	Heat Treatment *	Min Section in.	Properties and Typical Applications
A-339	60-40-18	60,000	1	⅛	High yield strength and wear resistance, such as gears, dies, drums and heavy duty machinery
	80-55-06	80,000	1	⅛	
	60-45-10	60,000	2	⅛	For maximum toughness and excellent machinability
	120-90-02	120,000	4	⅛	Heat treated grades for applications subject to high mechanical stress
	100-70-03	100,000	4	⅛	

Source: Iron Founders' Society Inc.
* Can be made by conventional heat treatment as well as by flame or induction. 2. Hardening not recommended. 3. Must be stress relief annealed. 4. All heat treated to raise yield and tensile strength

MALLEABLE IRON

ASTM Spec. No.	ASTM No.	Tensile Min psi	Yield Min psi	Elong. in 2 in. min %	Properties and Typical Applications
		STANDARD			
A-47	32510	50,000	32,500	10	Tough, impact and fatigue resistant, easily machined. Castable in ⅛-in. minimum sections. Automobile differential cases, steering gear housings, hubs, brackets, railroad car construction and track parts, agricultural implement parts
	35018	53,000	35,000	18	
		PEARLITIC			
A-220T	45010	65,000	45,000	10	High strength, hardness, resistance to abrasion, good machinability. Automotive valve rocker arms, transmission parts, agricultural implement gears, sprockets, crankshafts, weapon parts. Hardenable to 50-60 Rockwell C
	45007	65,000	45,000	7	
	48004	70,000	48,000	4	
	50007	75,000	50,000	7	
	53004	80,000	53,000	4	
	60003	80,000	60,000	3	
	80002	100,000	80,000	2	

Source: Malleable Founders' Society

CAST STEEL—Carbon Structural Grades

Tensile Min psi	Yield Min psi	Specifications ASTM or SAE	C range	Mn range	Properties and Typical Applications
60,000 Min Elong 24%	30,000	A 27-52T U 60-30 60-30	0.10-0.20	0.50-1.00	Low electrical resistivity, excellent weldability. Can be carburized and case hardened. Electrical equipment, gears, drums, railroad and furnace equipment
65,000 Min Elong 24%	35,000	A 27-52T 65-30, 65-35 SAE 0030	0.20-0.30	0.60-1.00	Excellent weldability, medium strength, good durability and machinability. Railroad, power shovel, rolling mill equipment, presses, gears, sprockets, machine frames, castings
70,000 Min Elong 24%	38,000	A 27-52T 70-36 A 95-44 70-36 A 216-53T WCB	0.25-0.35	0.60-1.00	Sprockets, machine frames. Miscellaneous medium strength castings
70,000 Min Elong 17%	40,000	SAE 080	0.50 max	1.00 max	High strength, toughness, good fatigue, wear resistance, high rigidity. Gears, rolls, blanking and forming dies, pinions, sprockets, machine tools, impellers, liners
75,000 Min Elong 16%	45,000	SAE 0050	over 0.50	1.00 max	Castings requiring rigidity and hardness

CAST STEEL—Low Alloy Engineering Grades

Tensile Min psi	Yield Min psi	Specifications ASTM or SAE	Normalized & Tempered	Water Quenched & Tempered	Properties and Typical Applications
80,000 Min Elong 22%	50,000	A 148-50T 80-40 80-50 SAE 080	1330 2317 4032 6120 Mn Mo* TS8130		Excellent weldability, medium strength with high toughness and good machinability; shock and abrasion resistance. Pneumatic tools, railroad equipment, pressure parts, automotive parts, track wheels, tractor treads, gears, sprockets
90,000 Min Elong 20%	60,000	A 148-50T 90-60 SAE 090	1335 3130 4137 4630 6130 Mn Mo* Mn V**	1330 4028 5135	Offers a variety of strengths and hardenabilities, depending on alloy content *Normalized & Tempered:* Oil well tools, sheaves, sprockets, locomotive parts, gears, cams, earth moving equipment, highly stressed castings
100,000 Min Elong 17%	65,000		3135 4140 4330 4635 6139 Mn Mo* TS8630 8630 4032 TS8130	4032 TS8130 Mn Mo*	*Quenched & Tempered:* Hardened castings, gears, cams, rollers, abrasion resistant castings, bucket teeth, small crusher jaws, conveyor chain links, dredge pumps, impellers, valve liners, oil field tongs
110,000 Min Elong 17%	85,000	A 148-50T 105-85 SAE 0105	4140 4335 9530	3130 4130 4030 4630 Mn Mo*	High resistance to impact, excellent strength, and toughness
120,000 Min Elong 14%	95,000	A 148-50T 120-95 SAE 0120	4340	3135 6130 Mn Mo* TS8630 8630 9530 4340	*Normalized & Tempered:* Excellent air hardening properties. Abrasion resistant applications, dredge pumps, gears, dies, rolling mill equipment. Molybdenum-bearing castings for shock valves, flanges, turbine casings hydroelectric equipment *Quenched & Tempered:* Good low temperature impact toughness, excellent abrasion resistance, deep hardening
150,000 Min. Elong 9%	125,000	A 148-50T 150-125 SAE 0150		4330 9530	Deep hardening, high strength, and high wear resistance
175,000 200,000	Custom steels for special engineered products				

Source: Steel Founders' Society of America

*Mn Mo—C 0.25-0.35, Mn 1.25-1.75, Mo 0.15-0.25
**Mn V—C 0.25-0.35, Mn 1.25-1.75, V 0.10-0.15

ALUMINUM Casting Alloys

Alloy	Composition Limits % max or range; Al remainder	Properties and Uses by Casting Type
13 ASTM S12A-B SAE 305	Cu 0.6; Fe 0.8; Si 11.0-13.0; Mn 0.35; Mg 0.10; Zn 0.35; Ni 0.50; Sn 0.15; others 0.25	Excellent castability with good corrosion resistance. Good mechanical properties. General-purpose alloy for large intricate parts with thin sections. Die: Typewriter frames, outboard motor pistons, dental equipment and instrument cases
Apex Z-33	Cu 2.5-3.5; Si 4.5-5.5; Mg 0.10; Zn 2.5-3.5; Fe 1.0; Mn 0.50; others 0.50	Good machinability, fair castability. Takes high polish. Similar to Z-50. Sand: Household appliances, automotive and miscellaneous machined parts
Apex Z-39	Cu 3.5-4.5; Si 8.5-9.5; Mg 0.1; Zn 1.5-2.5; Fe 1.2; Mn 0.5; Ni 0.5; others 0.4 each	Good castability and excellent machinability. Die: Automatic transmission impellers and housings, toys, brackets and other castings where machining is required
43 ASTM S5A SAE 35, 304	Cu 0.15; Fe 0.6; Si 4.5-6.0; Mn 0.35; Mg 0.05; Zn 0.35; Ti 0.25; others 0.05 each	Excellent castability and pressure tightness, good weldability and good corrosion resistance. Permanent Mold: Carburetor bodies, refrigerator shelf brackets and fittings, cooking utensils and general-purpose thin-section castings. Sand: Architectural and ornamental parts, pipe fittings, cooking utensils, food handling equipment and marine fittings. Die: General-purpose castings
Apex Z-50	Cu 4.0-5.0; Si 2.5-3.5; Mg 0.07; Zn 1.5-2.5; Fe 1.0; Mg 0.6; Ni 0.3	Good machinability, fair castability. Takes high polish. Sand: Household appliances, automotive and miscellaneous machined parts
108 ASTM CS-43A	Cu 3.5-4.5; Fe 1.0; Si 2.5-3.5; Mn 0.50; Mg 0.05; Zn 1.0; Ti 0.25; Ni 0.35; others 0.50	General-purpose alloy with fair castability. Sand: Manifolds, valve bodies and similar castings
A-108 ASTM SC64A	Cu 4.0-5.0; Fe 0.8; Si 5.0-6.0; Mn 0.50; Mg 0.10; Zn 1.0; Ti 0.25; others 0.50	Good castability and pressure tightness with good weldability. Permanent Mold: Ornamental grilles, reflectors and general-purpose castings. Used where leak tightness and moderate strength are needed
112 ASTM CS72A SAE 33	Cu 6.0-8.0; Fe 1.2; Si 1.0-4.0; Mn 0.6; Mg 0.10; Zn 2.5; Ti 0.25; Ni 0.35; others 0.50	Fair castability and good machinability. Early general-purpose alloy. 212 is similar but has better castability. Permanent Mold: Vacuum cleaner housings; general-purpose castings. Sand: Transmission housings, cover plates, manifolds and miscellaneous machined castings
A132 ASTM SN122A SAE 321	Cu 0.50-1.5; Fe 1.0; Si 11.0-13.0; Mn 0.35; Mg 0.9-1.3; Zn 0.35; Ti 0.25; Ni 2.0-3.0	Good high-temperature properties at 500-600° F. Low coefficient of thermal expansion. Weldability good. Permanent Mold: Pulleys and sheaves, automotive and diesel pistons
D132 SAE 332	Cu 2.0-4.0; Fe 1.0; Si 8.5-10.5; Mn 0.5; Mg 0.5-1.5; Zn 0.5; Ni 1.5; others 0.3	Similar to A132 but with better castability and machinability
138 ASTM CS101A	Cu 9.0-11.0; Fe 1.2; Si 3.5-4.5; Mn 0.6; Mg 0.20-0.35; Zn 1.5; Ti 0.25; Ni 1.0; others 0.50	High as-cast hardness. Good castability and good machinability. Permanent Mold: Sole plates for electric hand irons
142 (Y-alloy) ASTM CN42A SAE 39	Cu 3.5-4.5; Fe 0.8; Si 0.7; Mn 0.35; Mg 1.3-1.8; Zn 0.35; Cr 0.25; Ti 0.25; Ni 1.7-2.3; others 0.15	Good strength at elevated temperatures. Permanent Mold: Aircraft generator housings, motorcycle, diesel and aircraft pistons, air cooled cylinder heads. Sand: Diesel engine pistons and air cooled cylinder heads

ALUMINUM (C

ontinued)

Properties and Uses by Casting Type

ALUMINUM Wrought Alloys

Alloy Designation Al Assn.	Old Com'l.	Chemical Composition % max or range, Al remainder	Commercial Forms*	Typical Applications
EC	EC	Al 99.45 min	S,W,B,E,T	Electrical conductors
1100	2S	Si & Fe 1.0; Cu 0.20; Mn 0.05; Zn 0.10; Al 99.00 min	S,W,B,E,T,F	Sheet metal work, spun hollow ware and decorative parts. Good formability
1130	R30S	Si & Fe 0.7; Cu 0.20; Al 99.30 min	S	No. 1 reflector sheet
1160	None	Si & Fe 0.40; Cu 0.05; Al 99.60 min	S	Chemical equipment and tank cars for chemicals such as hydrogen peroxide
2011	11S	Si 0.40; Fe 0.7; Cu 5.0-6.0; Zn 0.30; Pb 0.20-0.60; Bi 0.20-0.60	W,B,E	Screw machine products
2014	14S R301	Si 0.50-1.2; Fe 1.0; Cu 3.9-5.0; Mn 0.40-1.2; Mg 0.20-0.80; Cr 0.10; Zn 0.25; Ti 0.15	S,W,B,E,T,F	Heavy-duty structures, aircraft structures and truck frames. High strength with good machinability
Alclad 2014		(same as above)	S	Used where corrosion resistance better than 2014 is needed
2017	17S	Si 0.80, Fe 1.0; Cu 3.5-4.5; Mn 0.40-1.0; Mg 0.20-0.80; Cr 0.10; Zn 0.25	W,B	Screw machine products. Higher strength than 2011
2018	18S	Si 0.90; Fe 1.0; Cu 3.5-4.5; Mn 0.20; Mg 0.45-0.90; Cr 0.10; Ni 1.7-2.3; Zn 0.25	F	Aircraft engine cylinder heads and pistons. High strength with good machinability
2024	24S	Si 0.50, Fe 0.50; Cu 3.8-4.9; Mn 0.30-0.90, Mg 1.2-1.8; Cr 0.10; Zn 0.25	S,W,B,E,T	Aircraft structures, truck wheels and screw machine products. High strength and hardness with good machinability
Alclad 2024		(same as above)	S	Same as 2024 with greater corrosion resistance
2025	25S	Si 0.50-1.2; Fe 1.0; Cu 3.9-5.0; Mn 0.40-1.2, Mg 0.05; Cr 0.10; Zn 0.25; Ti 0.15	F	Propeller blades and other high strength forgings
2117	A17S	Si 0.8; Fe 1.0; Cu 2.2-3.0; Mn 0.20; Mg 0.20-0.50; Cr 0.10; Zn 0.25	W	Cold heading wire and rivets
2218	B18S	Si 0.9; Fe 1.0; Cu 3.5-4.5; Mn 0.20; Mg 1.2-1.8; Cr 0.10; Ni 1.7-2.3; Zn 0.25	F	Aircraft engine cylinder heads and pistons, jet engine impellers and compressor rings
3003	3S	Si 0.60; Fe 0.70; Cu 0.20; Mn 1.0-1.5; Zn 0.10	S,W,B,E,T,F	Cooking utensils, chemical equipment, pressure vessels, tanks, piping, architectural applications and builders' hardware
Alclad 3003		(same as above)	S,T	Tea kettles, chemical equipment, heat exchange tubes, pressure vessels, storage tanks and flashing
3004	4S	Si 0.30; Fe 0.70; Cu 0.20; Mn 1.0-1.5; Mg 0.8-1.3; Zn 0.10	S	Special sheet metal work, shoe eyelets, pressure vessels and storage tanks
Alclad 3004		(same as above)	S	Industrial building sheet and flashing
4032	32S	Si 11.0-13.5; Fe 1.0; Cu 0.50-1.3; Mg 0.80-1.3; Cr 0.10; Ni 0.50-1.3, Zn 0.25	F	Pistons
4043	43S K145	Si 4.5-6.0; Fe 0.80; Cu 0.30; Mn 0.05; Mg 0.05; Zn 0.10; Ti 0.20	W,T	Intermediate strength welding wire. Cladding on brazing sheet. Architectural applications
5005	A50S, K155, R305	Si 0.40; Fe 0.70; Cu 0.20; Mn 0.20; Mg 0.50-1.10; Cr 0.10; Zn 0.25	S	Refrigerator applications
5050	50S	Si 0.40; Fe 0.70; Cu 0.20; Mn 0.10; Mg 1.0-1.8; Cr 0.10; Zn 0.25	S,W,B,T	Decorative refrigerator parts, builders' hardware and coiled tube
Alclad 5050		(same as above)	S	Better corrosion resistance than 5050
5052	52S	Si & Fe 0.45; Cu 0.10; Mn 0.10; Mg 2.2-2.8, Cr 0.15-0.35; Zn 0.20	S,W,B,T	Sheet metal work, home appliances, bus, truck and marine uses, hydraulic tubes, street light standards. Clock plates and parts. Workability and weldability good
5056	56S	Si 0.30; Fe 0.40; Cu 0.10; Mn 0.05-0.20; Mg 4.5-5.6; Zn 0.10; Cr 0.05-0.20	S,W	High strength aluminum wire, rivets, staple wire, zippers
Alclad 5056		(same as above)	W	Insect screen cloth
5086	K186	Si 0.40; Fe 0.50; Cu 0.10; Mn 0.20-0.70; Mg 3.5-4.5; Cr 0.25; Zn 0.25	S	Structural alloy with good weldability. Trailer tanks, unfired pressure vessels, towers, elevator cars and truck frames
5154	A54S	Si & Fe 0.45; Cu 0.10, Mn 0.10; Mg 3.1-3.9; Cr 0.15-0.35; Zn 0.20; Ti 0.20	S,W,B	Pressure vessels, marine use. High strength welding wire
5357	C57S K157	Si 0.12, Fe 0.17; Cu 0.07; Mn 0.15-0.45; Mg 0.8-1.2	S	Refrigerator parts, builders' hardware
6053	53S	Si 45-65% of Mg; Fe 0.35; Cu 0.10; Mn 1.1-1.4; Cr 0.15-0.25;	W	Rivet wire and rivets
6061	61S	Si 0.40-0.80; Fe 0.70; Cu 0.15-0.40; Mn 0.15; Mg 0.80-1.2; Cr 0.15-0.35; Zn 0.25; Ti 0.15	S,W,B,E,T,F	Heavy-duty structures where corrosion resistance is needed. Bridge railings, marine uses, furniture, nails
Alclad 6061		(same as above)	S	Clad for better corrosion resistance and improved appearance
6062	62S	Si 0.40-0.80; Fe 0.70; Cu 0.15-0.40; Mn 0.15, Mg 0.80-1.2; Cr 0.04-0.14; Zn 0.25; Ti 0.15	E,T	Alternate for 6061
6063	63S	Si 0.20-0.60; Fe 0.35; Cu 0.10; Mn 0.10; Mg 0.45-0.90; Cr 0.10; Zn 0.10, Ti 0.10	E,T	Pipe, railings, builders' hardware, windows, store fronts and architectural uses
6066	66S	Si 0.90-1.8; Fe 0.50; Cu 0.7-1.2; Mn 0.6-1.1; Mg 0.8-1.4; Cr 0.40; Ti 0.20	W,B,E,T,F	Trailer and aircraft structures. Strength and corrosion resistance between 6061 and 2024
6151	A51S	Si 0.6-1.2; Fe 1.0; Cu 0.35; Mn 0.20; Mg 0.45-0.80; Cr 0.15-0.35; Zn 0.25; Ti 0.15	F	Intricate forgings for machine and automotive parts
6951	J51S K160	Si 0.20-0.50; Fe 0.80; Cu 0.15-0.40; Mn 0.10; Mg 0.40-0.80; Zn 0.20	S,W,B,E,T	Heat exchangers and cooling systems
7001	HZM100	Si 0.35; Fe 0.40; Cu 1.6-2.6; Mn 0.20; Mg 2.6-3.4; Cr 0.18-0.40; Zn 6.8-8.0; Ti 0.20	E,F	High strength alloy for aircraft structures
7072	72S	Si & Fe 0.7; Cu 0.10; Mn 0.10; Mg 0.10; Zn 0.8-1.3	W	Metallizing wire for sprayed coatings for corrosion protection. Cladding alloy
7075	75S	Si 0.50; Fe 0.70; Cu 1.2-2.0; Mn 0.30; Mg 2.1-2.9; Cr 0.18-0.40; Zn 5.1-6.1; Ti 0.20	S,W,B,E,F	Aircraft structures and keys. High strength alloy
Alclad 7075		(same as above)	S	Aircraft structures for improved corrosion resistance over 7075
7076	76S	Si 0.40; Fe 0.60; Cu 0.30-1.0; Mn 0.30-0.80, Mg 1.2-2.0; Zn 7.0-8.0; Ti 0.20	F	Forgings, propeller blades

Note: Other metals allowed for each alloy: Each 0.05; total 0.15

*Abbreviations:
S — Flat rolled products, sheet, strip and plate
B — Bar
T — Tube and pipe
W — Wire and rod
E — Extrusions
F — Forgings

COPPER Casting Alloys

Common Name	Nominal Composition-Per Cent	Machinability Free-cutting brass 100	Properties and Applications
ASTM specification B143			
1A Tin bronze	Cu 88; Sn 10; Zn 2 (0.35 P optional)	50	Bearings and bushings, fasteners, valve bodies for temperatures to 550° F
1B Tin bronze	Cu 88; Sn 8; Zn 4	50	Steam pressure castings, oil pump, carburetors, gears
2A Leaded tin bronze	Cu 88; Sn 6; Pb 2; Zn 4	60	
2B Leaded tin bronze	Cu 87; Sn 8; Pb 1; Zn 4	60	
ASTM specification B144			
3A High-leaded tin bronze	Cu 80; Sn 10; Pb 10; Ni 0.75 max	80	Bearing bronzes. Those with lower copper content for heaviest loads. Bearings, shoes, wedges, bushings, uses where an antifriction soft material is needed. Acid resisting
3B High-leaded tin bronze	Cu 83; Sn 7; Pb 7; Zn 3; Ni 0.50 max	70	
3C High-leaded tin bronze	Cu 85; Sn 5; Pb 9; Zn 1; Ni 0.50 max	70	
3D High-leaded tin bronze	Cu 78; Sn 7; Pb 15; Ni 0.75 max	80	
3E High-leaded tin bronze	Cu 70, Sn 5; Pb 25; Ni 0.75 max	90	
ASTM specification B145			
4A Leaded red brass	Cu 85, Sn 5; Pb 5; Zn 5	90	Plumbing goods, pumps, hardware, general purpose moderate strength castings, ornamental objects, low pressure valves. Air, gas, oil and water fittings. Superior machinability
4B Leaded red brass	Cu 83; Sn 4; Pb 6; Zn 7	90	
5A Leaded semired brass	Cu 81; Sn 3; Pb 7; Zn 9	90	
5B Leaded semired brass	Cu 76; Sn 3; Pb 6; Zn 15	90	
ASTM specification B146			
6A Leaded yellow brass	Cu 71; Sn 1; Pb 3; Zn 25	80	Same type uses as red brasses. More difficult to cast, but sometimes preferred for color. Ferrules, manifolds, furniture hardware, ship trimming
6B Leaded yellow brass	Cu 67; Sn 1; Pb 3; Zn 29	80	
ASTM specification B147			
7A Leaded high-strength yellow brass	Cu 61; Sn 0.75; Pb 0.75; Zn 35.5; Fe 1; Al 0.75; Mn 0.25	60	Heavy duty valve stems, gears, cams, bearings, hydraulic cylinder parts, marine fittings, lever arms. Used where strength and toughness are required
8A High-strength yellow brass	Cu 58; Zn 40; Fe 1.25; Al 1.25; Mn 0.25	30	
8B High-strength manganese bronze	Varies to meet mechanical requirements	30	
8C High-strength manganese bronze	Varies to meet mechanical requirements	20	Pump bodies, gas engine bases, brackets. Screw-down nuts, hydraulic cylinder parts
ASTM specification B148			
9A Aluminum bronze	Cu 88; Fe 3; Al 9	20	Strong, corrosion-resistant alloys. 9B, C and D are heat treatable. Gears, bushings, bearings, propellers, pickling baskets, valve seats, marine equipment, worms, heavy-duty feed nuts, landing-gear parts. Good high heat strength
9B Aluminum bronze	Cu 89; Fe 1; Al 10	35	
9C Aluminum bronze	Cu 85; Fe 4; Al 11	20	
9D Aluminum bronze	Cu 81; Fe 4; Ni 4; Al 11	20	
ASTM specification B149			
10A Leaded nickel brass	Cu 57; Sn 2; Pb 9; Zn 20; Ni 12	70	Sometimes called nickel silvers. Corrosion resistant hardware, plumbing fixtures, ornamental castings, dairy and soda fountain equipment, musical instruments, boat and railroad car fittings, furniture and building trim
11A Leaded nickel bronze	Cu 64; Sn 4; Pb 4; Zn 8; Ni 20	..	
11B Nickel leaded bronze	Cu 66.5; Sn 5; Pb 1.5; Zn 2; Ni 25	.	
ASTM specification B198			
12A Silicon bronze	Cu remainder; Sn 1 (max); Pb 0.5 (max); Zn 5 (max); Fe 2.5 (max); Ni 1.5 (max); Al 1.5 (max); Si 1-5		Valve parts for corrosive conditions, naval hardware, chemical plant goods, brackets, pole-line hardware, clamps. Good corrosion resistance in absence of oxygen
13A Silicon brass	Cu remainder; Pb 1 (max); Zn 12-16;		
13B Silicon brass	Cu remainder; Pb 0.5 (max); Zn 12-16; Si 3-5		
No ASTM specification			
Silicon-aluminum bronze	Cu 91; Al 7; Si 2	50	Corrosion resistant. Higher strength than silicone brasses, valve bodies, radar parts, pressure castings
Silicon-aluminum bronze	Cu 90; Al 7; Si 3	50	
Beryllium bronze	Cu 96.5; Ni 1.1; Be 2.2 to 2.8	20-40	Heat treatable. Welding tips, non-sparking tools

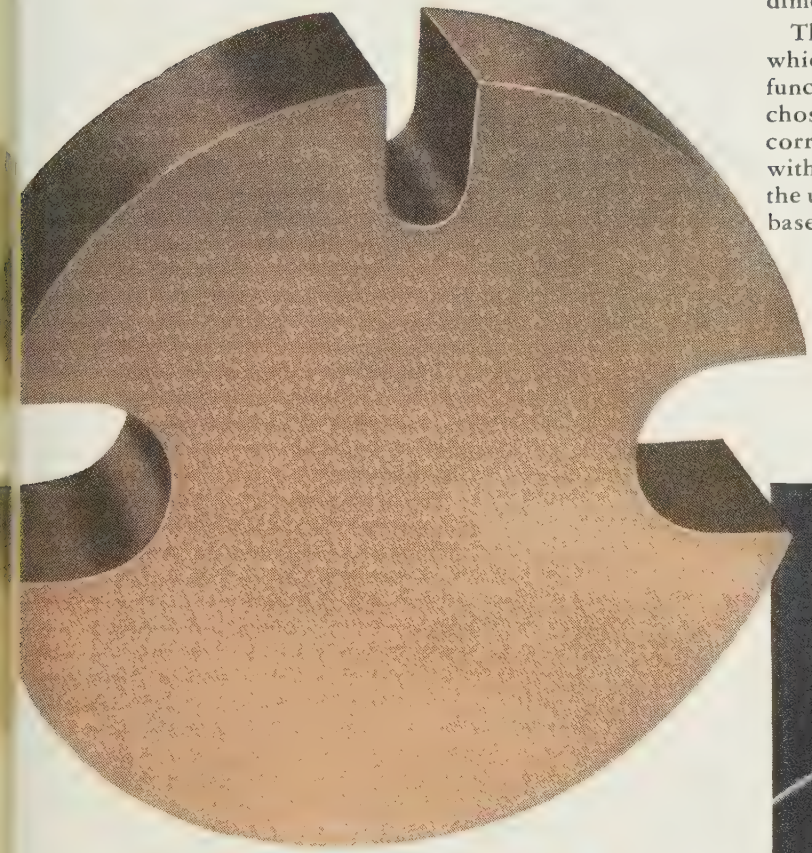
MAGNESIUM

ASTM No.	Dow Alloy	Chemical Composition (remainder is magnesium)	Forms Produced and Characteristics
AZ92A	C	Al 9.0; Mn 0.15; Zn 2.0; Cu 0.20 max	Sand and permanent mold castings. Excellent strength and good pressure tightness. Used in heat treated and aged condition for maximum yield strength
AZ63A	H	Al 6.0; Mn 0.25; Zn 3.0; Cu 0.20 max	Sand and permanent mold castings. Good toughness combined with excellent strength and elongation
EK30A	EK30A	Rare earths 3.0; Zr 0.35	Sand and permanent mold castings. For use at elevated temperatures (350-500° F). Good pressure tightness. Used mostly in heat treated and artificially aged condition
EZ33A	EZ33A	Zn 2.7; rare earths 3.0; Zr 0.7	Sand and permanent mold castings. For use at elevated temperatures (350-500° F). Good pressure tightness. Used mostly in artificially aged condition
EK41A	EK41A	Rare earths 4.0; Zr 0.6	Sand and permanent mold castings. Same as EZ33A, but used in artificially aged and in heat treated and artificially aged conditions
	HZ32XA	Zn 2.1; Zr 0.7; Th 3.0	Sand and permanent mold castings. For use at elevated temperatures (650-700° F). Good pressure tightness. Used mostly in the artificially aged condition
	HK31XA	Th 3.0; Zr 0.7	Sand and permanent mold castings. Same as HZ32XA, but used in heat treated and artificially aged condition
AZ91C	AZ91C	Al 8.7; Mn 0.15; Zn 0.7; Cu 0.08 max	Sand and permanent mold castings. Excellent strength and good pressure tightness. Used in applications requiring greater impact strength and elongation than C-T6
AZ91A	R	Al 9.0; Mn 0.20; Zn 0.6; Cu 0.08 max	Diecasting. Specification grade. Used for diecastings of good strength and ductility. Good casting characteristics
AZ91B	AZ91B	Al 9.0; Mn 0.20; Zn 0.6; Cu 0.25 max	Diecasting. Standard grade. Used for diecastings of good strength and ductility. Good casting characteristics
AZ31A	FS1	Al 3.0; Mn 0.45; Zn 1.0	Extrusions and sheet. Most commonly used alloy for extrusions and sheet. Good formability and weldability
AZ61A	J1	Al 6.5; Mn 0.20; Zn 1.0	Extrusions. Improved strength over FS1 but with less formability
M1A	M	Mn 1.2	Extrusions and sheet. For use where strength requirements are not severe and where stress relief after welding is not possible
ZK60A	ZK60A	Zn 5.7; Zr 0.55	Extrusions. Highest strength, used mostly in artificially aged condition. Good toughness

HEAVY EXTRUDED SHAPE

Over 25¢ per lb. saves

FOR THE STRONG ELECTRIC CORP.



REVERE

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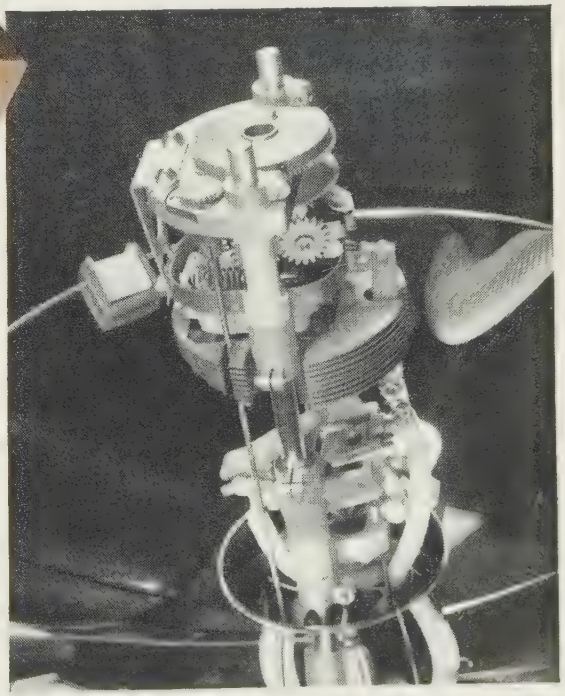
The unusual thing about this copper extruded shape is that it saves money in first cost as well as in machining time. The double economy amounts to over 25¢ per pound. The large illustration shows the shape as supplied in the form of a slug or pre-formed disc, 1 3/16" x 5". This begins as a long extrusion, from which Revere cuts the discs, and pickles them before shipping.

The customer is The Strong Electric Corp., Toledo 2, Ohio, which originally tried plate and bar, but found costs were too high. Revere Product Engineers, Methods and Production Departments collaborated with the company on the problem, and were able to develop the unusually heavy and economical shape. Strong reports a number of savings. One is that the shape is machined quickly and perfectly, with almost no rejects. This is due to the denseness and uniformity of the metal, a result of the high pressures exerted during extrusion. (Finishing operations include drilling bolt holes and cutting cooling fins.) As a secondary result of improved machining, the customer does not have to keep large inventories of metal to take care of spoilage, nor handle large quantities of scrap. Further, Revere supplies the discs in the correct thickness, eliminating a cutting-off operation for Strong. Incidentally, we are glad to supply shapes cut to dimensions, or in long lengths, as desired.

The completed part is an obturator-probe, which fulfills a control and heat dissipation function in a powerful searchlight. Copper was chosen for its ability to conduct heat and resist corrosion. Revere will be glad to collaborate with you in your search for economies through the use of extruded shapes in copper and copper-base alloys, and aluminum alloys.

Copper Extruded Shape, 1 3/16" x 5", as furnished.

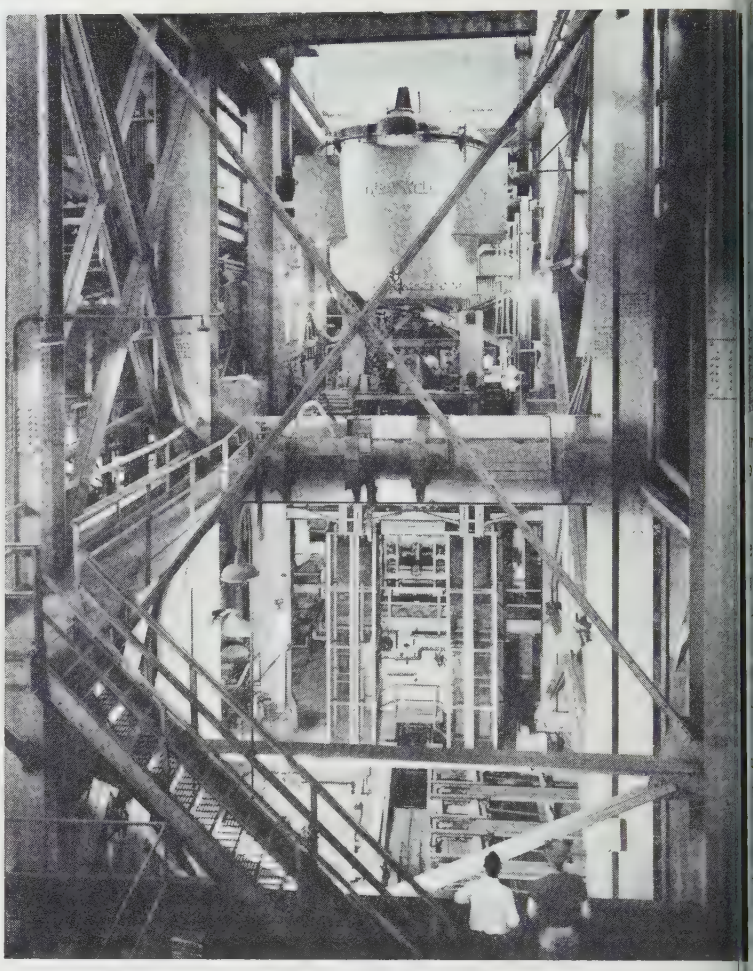
Shape in place in a carbon arc searchlight mechanism.



Continuous Casting . . .

A Year of Progress

Two-shift operation soon will grow to three at Atlas as first commercial machine has an anniversary. Operating data are piling up; so are profit prospects



OPERATION of the first commercial continuous casting machine at Atlas Steels Ltd., Welland, Ont., was top news a year ago (STEEL, Nov. 8, 1954, page 88).

Since then, you have heard rumors of equipment breakdowns, even economic failure.

To get at the facts, STEEL interviewed operating and management officials at Atlas.

Here is what they report:

Q: Has continuous casting proved to be anything less than you anticipated?

A: Not in the slightest. We fully expected to encounter d ficulties, and we did. The limi tions and disadvantages of p neering the operation were fu known beforehand.

In the first place, knowledge limited and hard won. Every ti a different composition or size to be cast, all data have to be c lected through operations. In c case, where we produce up to 1 different alloys every mon earlier savings are constantly ing re-invested in experiments.

Size of sections was limited first, but this is rapidly bei eliminated. We still are limited casting speed by the cutoff me anism. Optimum melt shop sch uling won't be achieved until t whole shop is designed around t casting machine. Then there's fractory wear caused by high temperatures and longer la times.

These things were all anticipa ed while the machine was still paper.

Q: Then the "birth pain

Yield Comparisons

Continuous Casting

Cold weight charged	53,377 lb
Tapped weight sent to casting machine	51,165 lb
Melting yield	96 per cent
Losses at casting machine	
Left in tundish	300 lb
Bottom discard	200 lb
Test metal	150 lb
Ladle skull	400 lb
Billets to the mill	50,115 lb
Casting yield	98 per cent
Products rolled from cogged material	47,450 lb
Cogging yield	94.5 per cent
Total yield from cold metal to billets	88.9 per cent

Conventional Processing

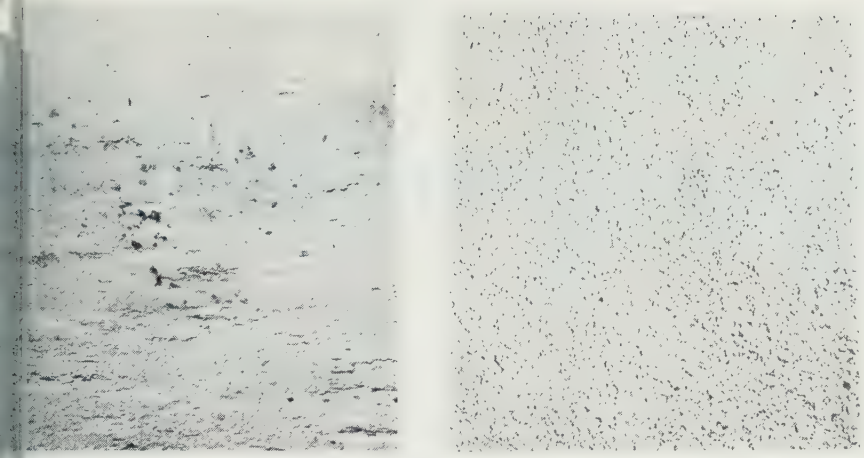
(To determine melting yield, every ingot from several months of production was weighed accurately instead of estimating.)

Normal melting yield—92 per cent
Short ingots or butts—1½ to 2 per cent

Billet yield—78.6 per cent

Over-all yield—72.5 per cent

(Compare this figure with the 77 per cent budget standard yield obtained when *estimating* individual ingot weights)



ace of cast slabs is so good that no conditioning need be performed. ged surface at left was quickly shotblasted to that in right-hand photo

n't really any worse than you ed they would be?

: That's right. We knew we ld have to develop our back- und data, men and techniques h scratch. Consequently, even r our operational schedules are out to provide the largest per- age of our time for production ing and the rest for develop- t work on new grades and s.

: Is any element—data, men echnique—more important than other to the success of the cess?

: If there is any single ele- t that is most vital, it is time. e our first experimental cast months ago, we have accumu- d a wealth of experience that bles us to produce a commer- product today. We also have time to appreciate the size and complexity of the task to which we have set ourselves.

Of the three factors, however, only two are affected by time . . . men and data. We have two crews trained as operating teams, and a third crew soon will be ready to make casting an around-the-clock operation. Data, of course, have been accumulating all the while.

Q: What compositions and sizes have been cast this past year?

A: The table gives a good idea of the different grades with which we have been working. As to sizes, we have cast mainly into 5½ x 7½-in. and 5½ x 21½-in. molds, with the bulk going into the larger size because it best fits our sheet and strip requirements. While we are not prepared to release tonnage figures, the 300 and 400 series stainless steels have been the biggest tonnage items.

Q: Has there been any trouble meeting physical and metallurgical requirements?

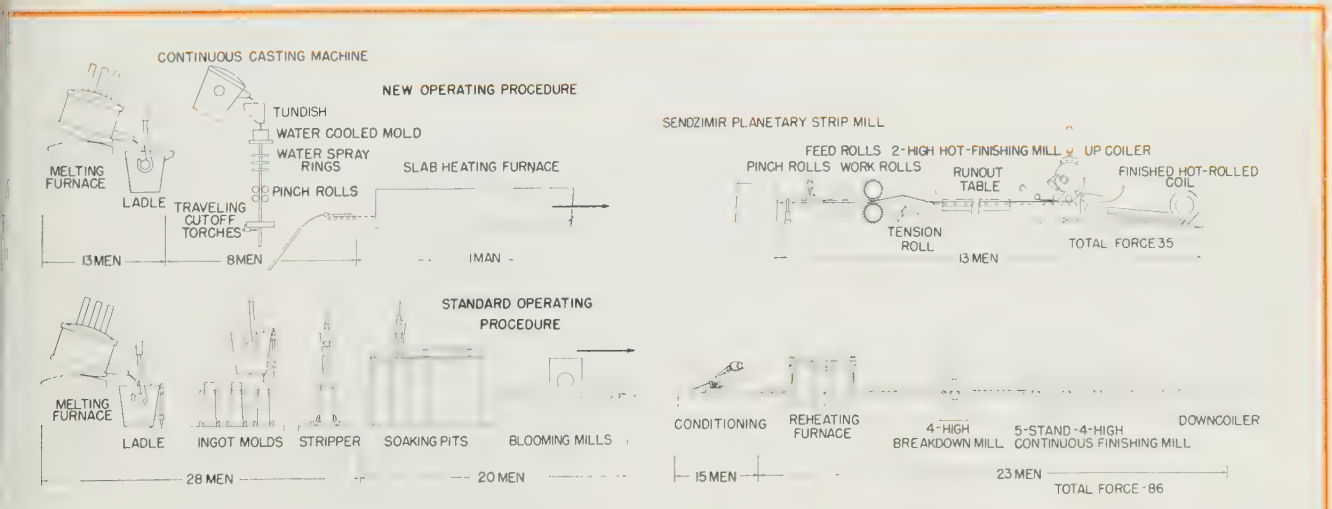
A: None that we didn't expect to encounter. In fact, we were agreeably surprised to find that anticipated segregation problems were neither severe nor difficult to solve. We have yet to encounter the quality problem that can be attributed to continuous casting.

Q: We've heard that some of the other pioneers in continuous casting are having trouble with internal grain structure irregularities. Have you?

A: In the early stages of equipment and again during the early operating days, most of the castings made were of unsuitable quality. Most were rejected because of poor cast structure, primarily due to a faulty center.

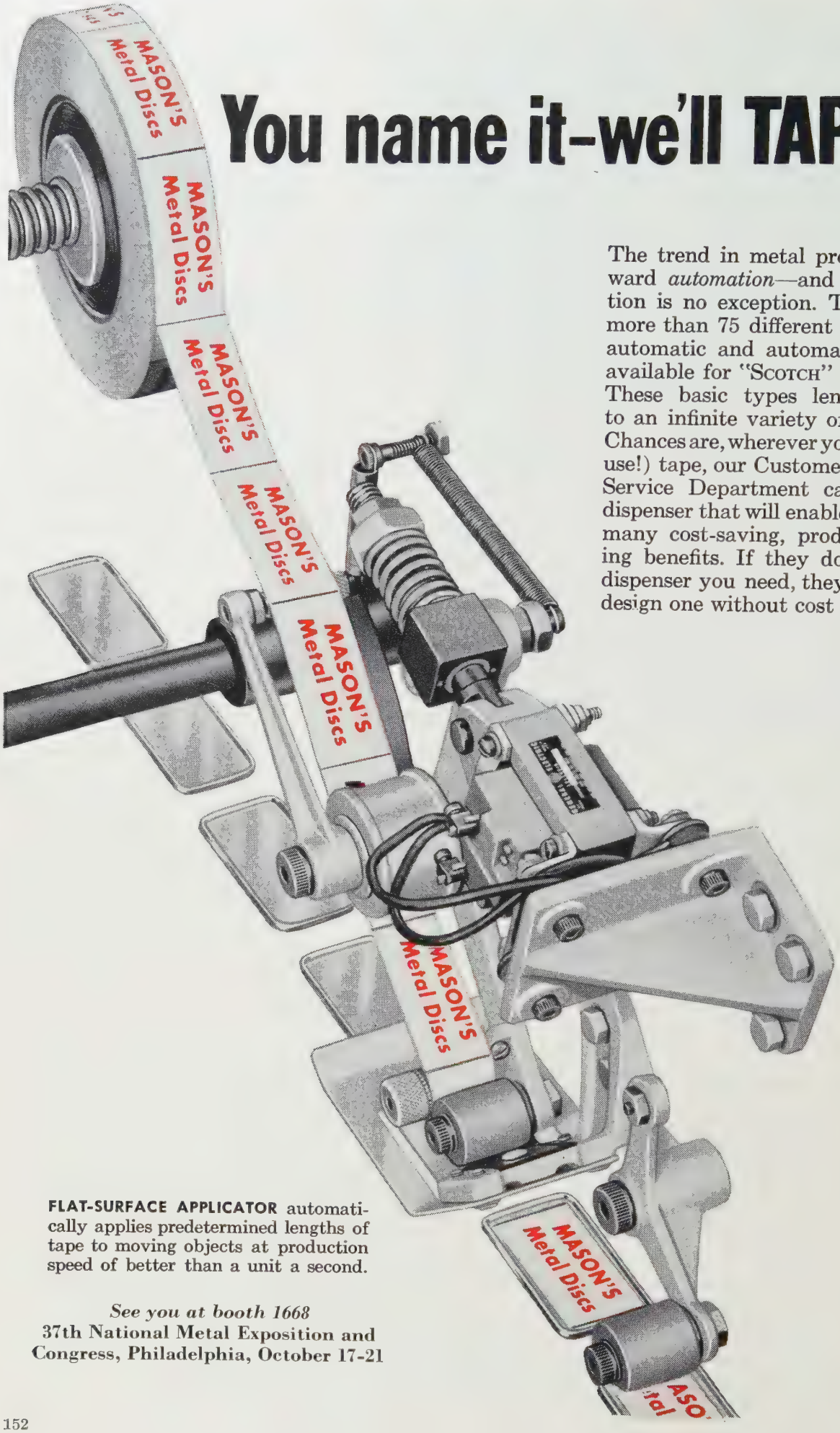
The early stages of casting show a characteristic dendritic pattern. As pouring progresses and the temperature drops, this pattern changes abruptly from dendritic to equiaxed, caused by a combination of lower metal temperatures and rapid billet cooling.

In pouring later heats, the temperature and cooling rates were adjusted to favor the solidification with the equiaxed crystals throughout the section. We changed our practice to provide adequate cooling immediately below the mold and promote rapid solidification, followed by less drastic cooling. The latter allowed residual heat



How well continuous casting stacks up in manpower requirements is apparent. The planetary hot strip mill also is being pioneered at Atlas

You name it–we'll TAPE it



The trend in metal processing is toward *automation*—and tape application is no exception. There are now more than 75 different manual, semi-automatic and automatic dispensers available for "Scotch" Brand Tapes. These basic types lend themselves to an infinite variety of adaptations. Chances are, wherever you use (or *could* use!) tape, our Customer Engineering Service Department can provide a dispenser that will enable you to enjoy many cost-saving, production-speeding benefits. If they don't have the dispenser you need, they'll be glad to design one without cost or obligation.

FLAT-SURFACE APPLICATOR automatically applies predetermined lengths of tape to moving objects at production speed of better than a unit a second.

See you at booth 1668
37th National Metal Exposition and Congress, Philadelphia, October 17-21

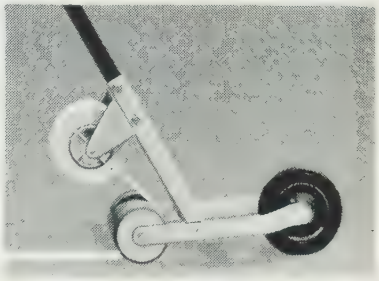
. . . Manually

1. HAND APPLICATION of tapes can be made easier with proper dispensers. Above: "SCOTCH" Brand Filament Tape used to seal and reinforce shipping carton is applied from easily loaded dispenser. A flick of the wrist cuts tape to desired length.

2. PACKAGING OPERATIONS can be speeded by specially designed dispensers. Above: "SCOTCH" Brand P-35 Dispenser applies strip of tape around twisted neck of polyethylene bag; leaves tape tab for price; gives quick, clean cut-off with no tape waste.

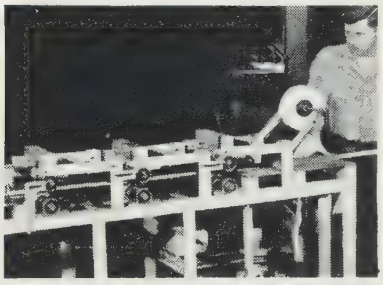
. . . Semi-Automatically

3. EASY WAY TO WRAP a bulky bundle: As automobile bumper is lowered into wrapping cradle, battery of air-operated dispensers deliver predetermined lengths of "SCOTCH" Brand Filament Tape to workers. Fast, efficient wrapping at production line speeds.



4. SPECIAL DISPENSERS solve special problems. Above: "SCOTCH" Brand Lane Marking Applicator applies "SCOTCH" Colored Plastic Tape on floor to mark lanes, indicate storage areas etc. Roller presses tape down firmly for tight, long-lasting bond.

. . . Fully-Automatically



5. APPLICATION of "SCOTCH" Brand Masking Tape to aluminum strips is handled by this applicator custom-designed by our service department. Strips are masked for protection during drilling and boring operations; dispenser does it at production speeds.

6. RAPID BUNDLING of conduit, rigid-wall pipe, and bar stock with the Guide Company Bundler, Model CG. Machine secures bundles at each end with "SCOTCH" Filament Tape; handles three a minute. (Manufactured by Guide Company, Canfield, Ohio.)

DISPENSERS *for*

Reg. U.S. Pat. Off.

SCOTCH BRAND

Pressure-Sensitive Tapes

ASK YOUR REGULAR DISTRIBUTOR ABOUT "SCOTCH" BRAND DISPENSERS OR MAIL THIS COUPON

MINNESOTA MINING AND MFG. CO.
St. Paul 6, Minn. GK-105

Please send me complete information on the types of dispensers checked:

1___ 2___ 3___ 4___ 5___ 6___

___Would like a survey of my plant to see where automatic tape applying equipment can cut my costs... speed production.

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

CITY.....ZONE....STATE.....

in the casting to release the coo ing stresses which cause the i ternal hot tearing.

Q: If you were to start ov with the knowledge and expe ence you have gained, wh changes in plant or equipme would be evident?

A: If the casting machine we to be installed in an existing plan about all we would do is insta the equipment closer to the ste production units. But if we we designing a whole new plant, would most likely be similar layout to the one in the accom panying drawing. Then, too, w would want to incorporate some the minor changes we have mad on the machine itself, if the prove worth-while.

Q: Can you discuss, even i general terms, the cost picture you've found it?

A: We have some most interes ing cost analyses, but unfortunat ly not for release. In general, i creased yield is the biggest facto on the credit side of the ledge How we arrive at some of ou yield gains is brought out in th accompanying material (see box

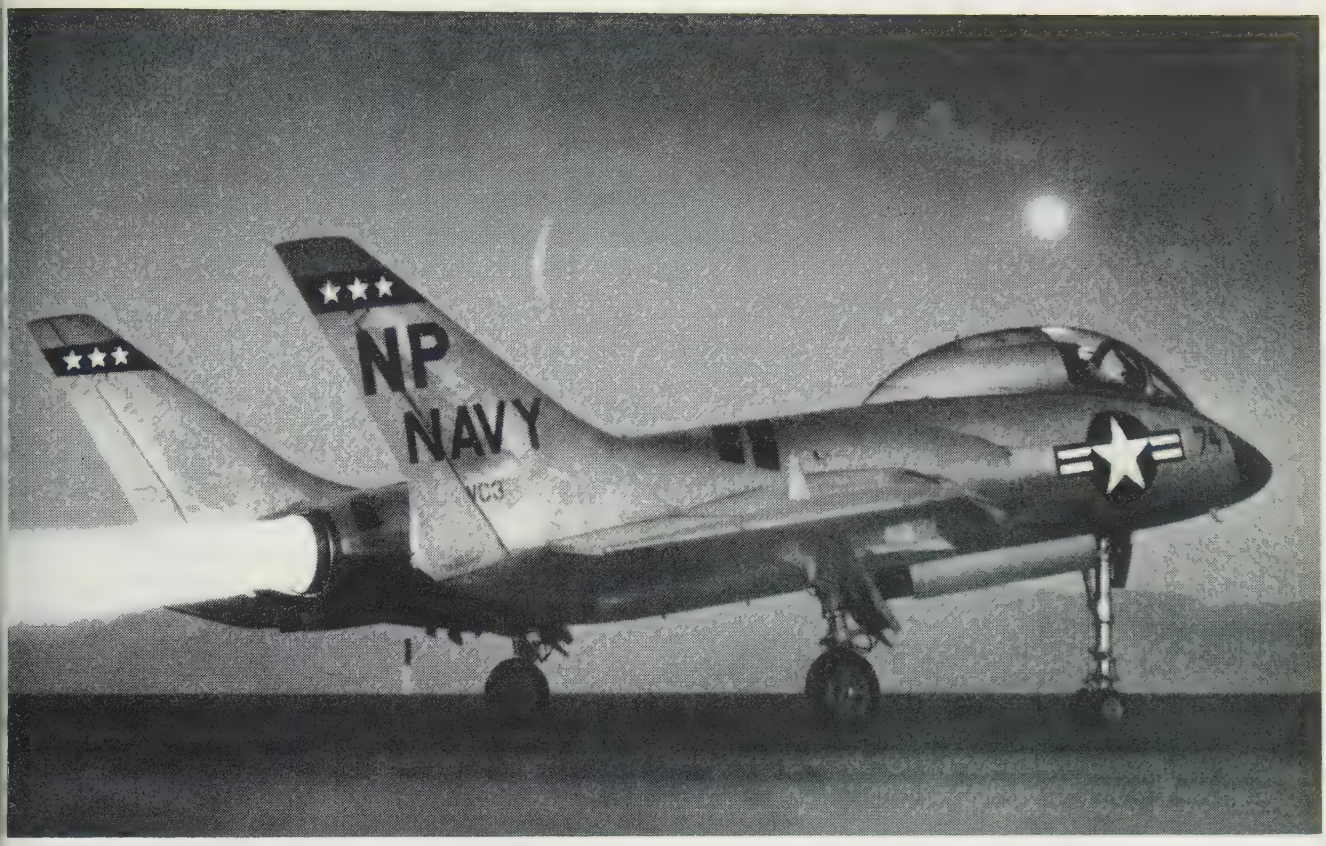
Our pit and hot top cost av erages about $8 a ton. To equa that rate with the casting ma chine, we should cast about 250 tons of metal a month. At tha figure and over, the melt shop b gins to realize all the yield sav ings.

Q: What about the savings i manpower and process time Aren't they sizable factors, too?

A: They certainly are, but be ing an alloy producer, the in creased yield looks especially goo to us.

A carbon steel producer, how ever, would be more interested i the low capital investment, th more direct route to the finishing facilities and the fewer men i would take to produce finishe steel. Yield won't be quite so im portant to him as it is to us.

We can now say, for instance that elimination of the blooming mill is possible. Many experi ments have been run with cas slabs being rolled immediately t hot bands with no prior working Results are promising.

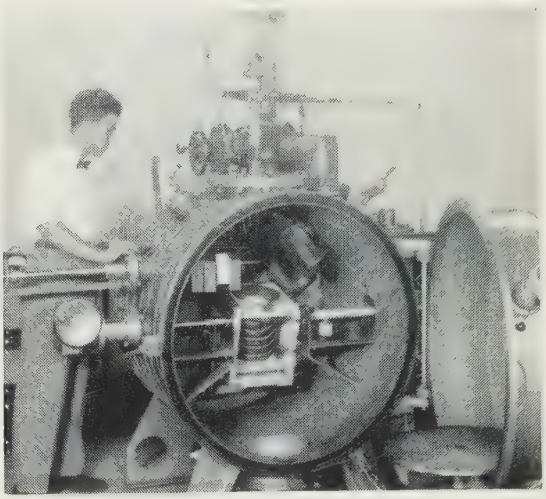


Will Vacuum Melted Metals do for YOUR Product what they do for Jet Planes?

Vacuum Furnace will help you get the Answer

e roaring gas turbines of 1000 mph jet planes use cuum melted metal parts to withstand temperatures d stresses that would ruin conventional metal. If you metal under severe conditions in your product . . . or quire "cleaner" metals for smoother surfaces, you ould be testing vacuum melted metals today. A high cuum furnace will help you speed up these tests by plying your researchers with a ready supply of rying alloys. We have made and operated more h vacuum furnaces than anyone in the world. Can we lp you, too? Send coupon below today.

us at the National Metal Exposition • Philadelphia Oct. 17-Oct. 21 • Booth 1577



NRC Model 2555 Vacuum Furnaces are now being used by leading aircraft companies, engine manufacturers, investment casters, specialty steel producers to speed up the development of new materials that will meet ever more severe operating requirements.

NRC
NARESCO
EQUIPMENT
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Subsidiary of NATIONAL RESEARCH CORPORATION
Dept. 1210, Charlemont St., Newton Highlands 61, Mass.

Send me your Vacuum Furnace Bulletin ☐ Have your representative call ☐

Name.....Title.....
Company.....
Address.....
City.....Zone....State.....

Running Ten Nuts at a Crack...

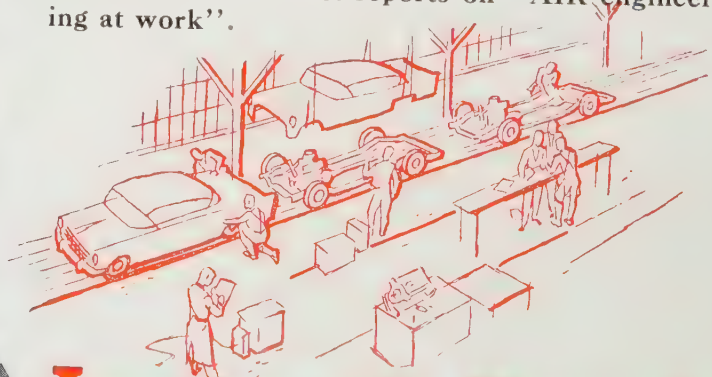
SAVES $12,000 *a year.*

This large auto manufacturer formerly used two ¼ ton presses to position a differential carrier in the rear axle housing. Then the ten ⅜" nuts were run individually. Only experienced operators could control torque so that it met specifications. Naturally the engineers wanted to eliminate the press operation and improve torque control.

AIR engineering by Ingersoll-Rand provided the answer and saved $12,000 a year. A 10-Spindle Multiple Nut Runner is now suspended over the moving conveyor. The differential carrier is hand set on the housing, and dropped to within ⅛" of its final location. The 10-spindle nut runner quickly and accurately draws it into final position as it runs all 10 nuts at once . . . and to the required 50 ft. lbs. torque. The press operation is eliminated, and simultaneous running of the nuts eliminates binding.

If you are in any way responsible for cutting costs in your plant, write us on your company letterhead, and we will arrange for you to see I-R's confidential manual of reports on "AIR engineering at work".

Ingersoll-Rand Multiple Nut Runner runs 10 nuts at once, all to exact torque.

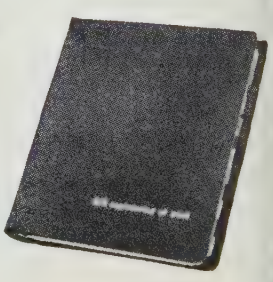


Ingersoll-Rand

11 Broadway, New York 4, N.Y.

AIR engineering Manual

Don't miss over 100 interesting case history applications of AIR engineering in this confidential manual.



8-147

37th NATIONAL METAL CONGRESS & EXPOSITION

PHILADELPHIA

PROGRAM

AMERICAN SOCIETY FOR METALS

Schaefer
ent-elect

D. S. Clark
Vice president-elect

eminar on Theory of Alloy Phases

Ben Franklin Hotel

Co-ordinator—Paul A. Beck, University of Illinois

Saturday, Oct. 15—9:30 a.m.

Bonding Forces in Solids—Fred Seitz, University of Illinois.

Band Theory of Bonding in Metals—J. C. Slater, Massachusetts Institute of Technology.

Density of States as Determined by Soft X-Ray Spectroscopy—C. H. Shaw, Ohio State University.

Saturday, Oct. 15—2 p.m.

Intermediate Phases and Electronic Structure—T. Massalski, University of Chicago.

Crystal Structure and Atomic Size—F. Laves, Polytechnic Technical Institute, Zurich, Switzerland.

Bonding Forces in Alkali Metals—Dr. H. Brooks, Cruft Laboratory, Harvard University.

Saturday, Oct. 15—8 p.m.

The Electronic Structure of Metals and Alloys—L. Pauling, California Institute of Technology.

Sunday, Oct. 16—9:30 a.m.

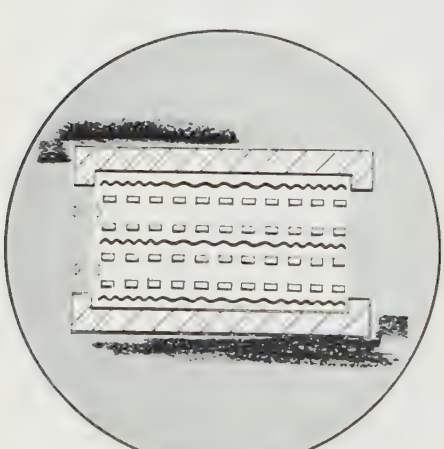
Intermediate Phases in Alloys of the Transition Elements —Pol Duwez, California Institute of Technology.

Ferromagnetism, Antiferromagnetism and Crystal Structure—Clarence Zener, University of Chicago.

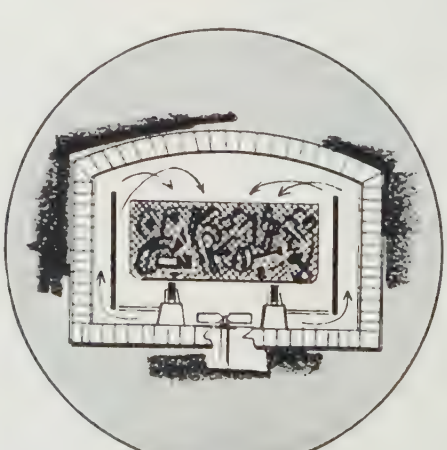
Atomic and Magnetic Ordering in Intermediate Phases J. S. Kasper, General Electric Co.

BRAND NEW – MODERN ELECTRIC ELEMEN

This shows graphically how the new Lindberg CORRTHERM electric heating element actually fills the furnace with walls of glowing heat. Note also that CORRTHERM is conveniently hung from simple brackets requiring no complicated connections or construction. This element operates at extremely low voltage, eliminating shock or short hazards.



In continuous type furnaces CORRTHERM elements hang between lines of work as well as on side walls. Note how closer corrugations (at each end of element) compensate for incoming cold work and door losses.



CORRTHERM elements act as natural baffles to direct forced convection streams through the charge. The use of electric furnaces for carburizing and carbonitriding now becomes completely practical.

No retort needed in pit-type carburiz furnace with CORRTHERM elements. Ag see how elements serve as baffles to dir forced convection stream through char

FOR LINDBERG FURNACES

ever before has there been an electric heating element like this ORRTHERM by Lindberg. Its revolutionary advantages now make e use of electricity as the source of heat, practical, efficient and economical for all heat treating processes.

Ideal for use in any electric heat treating furnace, CORRTHERM ements have particular advantages for carburizing and carbonitriding. his new element completely eliminates problems formerly created by e use of electricity in these types of furnaces. These exclusive adntages of CORRTHERM explain how and why:

OW VOLTAGE: Operates at extremely low voltage. No leakage rough carbon saturation. Around Lindberg we talk about it as the ectric element "without any electricity . . . to speak of!"

TMOSPHERE CIRCULATION: Elements act as baffles to direct circution of convection streams.

AFETY: Extremely low voltage also eliminates shock or short hazards.

URABILITY: Watts density at all-time low. Element practically indeuctible. Work load or operator's charging tool can't hurt it.

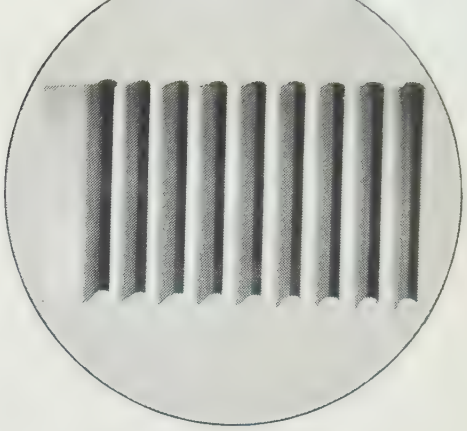
SILY INSTALLED: Element is not enclosed, just hangs in furnace. o complicated mountings required.

If electricity is the preferable source of heat for your metal treating ocesses find out how advantageously CORRTHERM elements can applied to your requirements. Just get in touch with your nearest ndberg Field Representative. (Consult your classified phone book.)

See CORRTHERM at ASM Show. The new CORRTHERM element will have its first public showing at the ASM Show in Philadelphia, October 17 to 21. Plan to see this and many other new developments by Lindberg in the furnace and related fields in the Lindberg Booth No. 230.

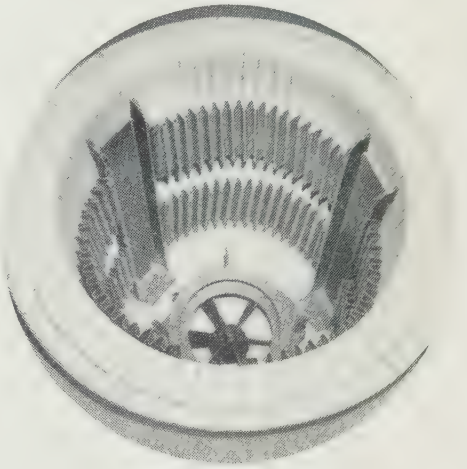
LINDBERG ENGINEERING COMPANY

2441 West Hubbard Street, Chicago 12, Illinois
Los Angeles Plant: 11937 Regentview Ave., at Downey, California



CORRTHERM elements are large sheets of corrugated nickel chromium. They were developed in Lindberg laboratories by Lindberg metallurgists and engineers.

This shows installation of CORRTHERM elements in one of two large rotary furnaces currently being erected in the field by Lindberg's associate company, Lindberg Industrial Corporation.



An installation of CORRTHERM elements in a carburizing pit-type furnace. Simplicity of mounting makes replacement easy and economical.

Safety! Extremely low voltage makes CORRTHERM elements completely safe. Let operator or work load bang it if they will. Neither element nor operator will be hurt.

CORRTHERM

by LINDBERG

ASM PROGRAM

Sunday, Oct. 16—2 p.m.

Atomic Moments of Transition E ments in Solid Solution Alloys C. Shull, Massachusetts Institu of Technology.

Solid Solutions and Ordering—B. A erbach, Massachusetts Institute Technology.

Alloy Phase Diagrams—G. V. Ra nor, Birmingham University, En land.

TECHNICAL PAPERS

Monday, Oct. 17—9:30 a.m.

Titanium

The Rate of Diffusion of Carbon Alpha and Beta Titanium—F. Wagner, E. J. Bucur and M. Steinberg, Horizons Inc.

Hydrogen Contamination in Desca ing and Acid Pickling of Titaniu —G. A. Lenning, C. M. Craighe and R. I. Jaffee, Battelle Memori Institute.

Mechanical Properties of Ti-Cr-M Alloys as Affected by Grain Si and Grain Shape—H. R. Ogde F. C. Holden and R. I. Jaffe Battelle Memorial Institute.

Investigation of the Heat Treatab ity of the 6%-Aluminum 4%-V nadium Titanium-Base Alloy R. G. Sherman, H. D. Kessler, T tanium Metals Corp. of Americ

Mechanical Properties

Notch Ductile High Strength Nodul Irons—G. A. Sandoz, H. F. Bish and W. S. Pellini, Naval Researc Laboratory.

Fatigue and Anisotropy in Copper M. L. Ebner and W. A. Backofe Massachusetts Institute of Tech nology.

The Influence of Vibration on th Solidification of an Aluminum A loy—R. S. Richards, Titaniu Metals Corp.; and W. Rostoke Armour Research Foundation.

Monday, Oct. 17—2 p.m.

Titanium-Zirconium

Nature and Decomposition Kinetic of Alpha Prime in Titanium-Va nadium Alloys—F. R. Brotzen, Ric Institute; E. L. Harmon and A. H Troiano, Case Institute of Tech nology.

Metallography of Tempering of A pha-Prime in Titanium Alloys— R. F. Domagala and W. Rostoke Armour Research Foundation.

Tensile Properties of Zircomium Chromium Alloys: Particle Strengthening Effects—J. H. Kee ler, General Electric Co.

Progress in the Development o Creep-Resistant Zirconium Alloy —Walston Chubb, Battelle Me morial Institute.

THE WALES WAY

SEE IT IN ACTION AT THE WALES EXHIBIT

ome and actually operate this new
.LES Fabricator yourself...see why tool-
g and production men responsible for
roducing quality products on schedule,
at less cost, use THE WALES WAY to save
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Put your punching, notching and nibbling
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Bring your sketches or actual parts, WALES
men will be on the spot to show you how
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If you miss the Metal Show, write for
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OCT. 17-21

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WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

ASM PROGRAM

Tuesday, Oct. 18—9:30 a

Tempering of Steel

Some Effects of Silicon on the chanical Properties of Strength Steels—C. H. Shih, Averbach and Morris C Massachusetts Institute of nology.

Some Relationships Between durance Limit and Torsional erties of Steel—S. T. Ross, Sernka and W. E. Jominy, C ler Corp.

The Influence of Molybdenum Tungsten on Temper Embr ment—A. E. Powers, Materi Processes Lab., General El Co.

Hardness of Tempered Martens Carbon and Low-Alloy Ste R. A. Grange, Fundamental search Laboratory, and R Baughman, United States Corp.

Deformation

Deformation of Beryllium S Crystals at 25 to 500° C—I Lee and R. M. Brick, Scho Metallurgical Engineering, versity of Pennsylvania.

Grain Boundary Creep in Alum Bicrystals—F. N. Rhines, W Bond and M. A. Kissel, Car Institute of Technology.

Deformation and Fracture M nisms of Polycrystalline Magne at Low Temperatures—F. E. H er, P. R. Landon and J. E. I University of California.

Influence of Cold Work on Stre of Steel at Elevated Tempera —Paul Shahinian, Naval Rese Laboratory.

Tuesday, Oct. 18—2 p.m

Steel

Inhibition by Nitrogen of Graph tion in Steel—G. V. Smith, Co University, and B. W. R American Steel & Wire Div United States Steel Corp.

An Approach to the Study of Effect of Rare-Earth Additio Steel by Use of Radioactive T Techniques—C. S. DuMont, J Gates, Battelle Memorial Insti and C. N. Henderson, Mallinc Chemical Works.

The Optimum Boron Content Hardenability—J. C. Shyne, H Morgan and D. N. Frey, Ford tor Co.

On Banding in Steel—C. Jat D. J. Girardi and E. S. Row Timken Roller Bearing Co.

Wednesday, Oct. 19—2 p

Steel

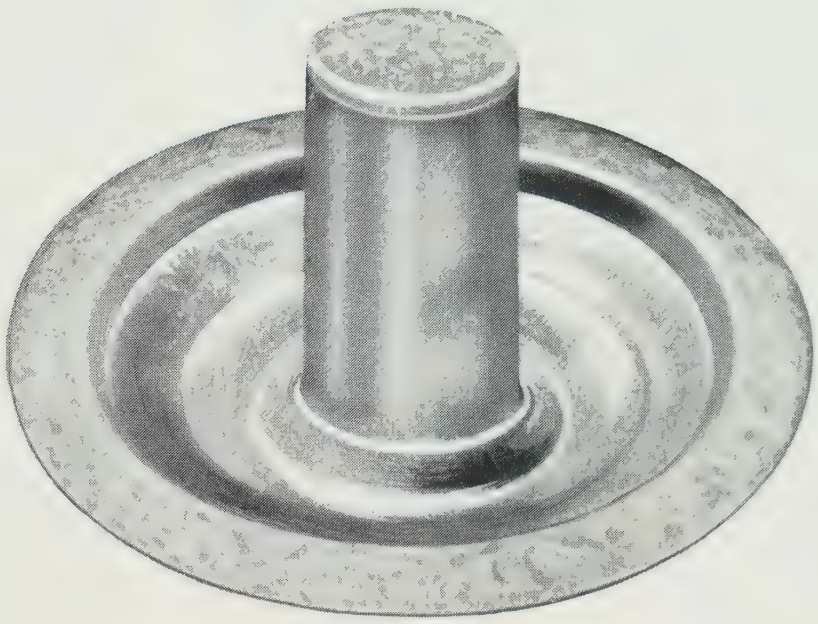
Some Effects of Metal Removal Heat Treatment on the Surface Hardened Steel—Karl E. Beu, C year Atomic Corp., and Donal Koistinen, General Motors Co

Effect of Temperature on Del Yielding of Mild Steel for S Loading Duration—Josephy Krafft, Naval Research Labora

Effect of Tempering Tempera on Stress Corrosion Cracking Hydrogen Embrittlement of

CHALLENGE:

THE STRONGEST MADE BY ANY GALVANIZED SHEET —



Anything that can be made of steel sheets can be made of

WHEELING SOFTITE®

galvanized sheets!

THIS is a muffler head made of Wheeling SOFTITE Galvanized Sheets. Notice the severe draw, the intricate bends and folds. Now see how tightly the coating clings to the base metal. No cracks, no flakes, no strain.

That's because Wheeling SOFTITE has the tightest zinc coating yet produced...so tight, in fact, that you can use it to make anything you can make of steel sheets.

That's SOFTITE...*Wheeling* SOFTITE...made by the company that led with the development of COP-R-LOY, the original copper-bearing steel pipe and perfected DUCTILLITE, the original cold reduced tin plate which revolutionized the tin plate industry, and opened new fields to the can maker and packer. Now, because of the unprecedented demand for SOFTITE Galvanized Sheets, Wheeling has been forced to triple its production facilities in 1955.

IT'S WHEELING STEEL

T SALES OFFICES—Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling

AME **COP-R-LOY**® THEN *Ductillite*® NOW WHEELING **SOFTITE**

tensitic Stainless Steels—
Lillys and A. E. Nehrenberg
cible Steel Co. of America.
Static Fatigue of High-Strength
—R. H. Raring and J. A. Ri
Naval Research Laboratory.

Molybdenum-Vanadium-Tanta

The Initiation of Discontinuous
ing in Ductile Molybdenum—
Hendrickson, D. S. Wood and
Clark, California Institute of
nology.
Properties of Vanadium Consoli
by Extrusion—C. E. Lacy and
Beck, General Electric Co.
The Mechanical Properties of
dium-Base Alloys—W. Ro
and A. S. Yamamoto, Armou
search Foundation; R. E.
Rem-Cru Titanium Corp.
Rolling Textures in Tantalum
lation to BCC Metals—J. W.
and W. R. Hibbard Jr., G
Electric Co.

Thursday, Oct. 20—9:30

Stainless Steels

Influence of Alloying Elements
Impact Transition Behavior o
Cr Steels Aged at 900° F—
Whittenberger and E. R. Ros
U. S. Steel Corp.
Creep Rupture Properties of
Worked, Type 347 Stainless S
N. J. Grant, A. G. Bucklin
Warren Rowland, Massachu
Institute of Technology.
Notch Ductility of Type 410
Cr) Stainless Steel—F. A. Bi
H. F. Bishop and W. S. P
Naval Research Laboratory.
The Influence of Strain Rat
Temperature on the Ductili
Austenitic Stainless Steel—G
Form and W. M. Baldwin Jr.,
Institute of Technology.

Thursday, Oct. 20—2 p.

Stainless Steels

High Nitrogen Austenitic
Steels—V. F. Zackay, Scie
Laboratory, Ford Motor Co.;
Carlson, Hoskins Mfg. Co.
P. L. Jackson, Misco Pre
Casting Co.
The Effect of Composition and S
ture on the Creep Rupture
erties of 18-8 Stainless St
F. C. Monkman, P. E. Price
N. J. Grant, Massachusetts
tute of Technology.
Austenitic Fe-Cr-C-N Stainless
—G. F. Tisinai, J. K. Stanley
C. H. Samans, Engineering
search Dept., Standard Oil
(Indiana).
Effects of Chemical Composition
Heat Treatment Upon the M
structure and Corrosion Resis
of AISI Types 309 and 310—
Carney and E. R. Rosenow,
Steel Corp.

LECTURE ON EMBRIT
MENT PHENOMENA

By B. R. Quenteau, Chief M
lurgist, U. S. Steel Corp.

Tuesday, Oct. 18—4:30 p.

Summary of Embrittlement

PROGRAM

nena and General Discussion of ir Effects.

uesday, Oct. 18—8 p.m.

Hardening and Precipitation brittlement.

nesday, Oct. 19—4:30 p.m.

ittlement by Gases.

dnesday, Oct. 19—8 p.m.

er Brittleness and Sigma Phase.

The 10th ASM metallographic exhibit will be in nvention Hall during the etal show. Twelve classifications of photomicrographs are designated. A grand prize will be esented for the best entry. ue ribbons will be given the best entry in each ssification. Other winners ll get honorable mentions. ize-winning entries will be cluded in the ASM traveling exhibit, which starts rly in 1956.

NFERENCE ON DUCTILE ROMIUM AND ITS HIGH ALLOYS

onsors: Office of Ordnance search, U. S. Army; ASM

nday, Oct. 17—10:30 a.m.

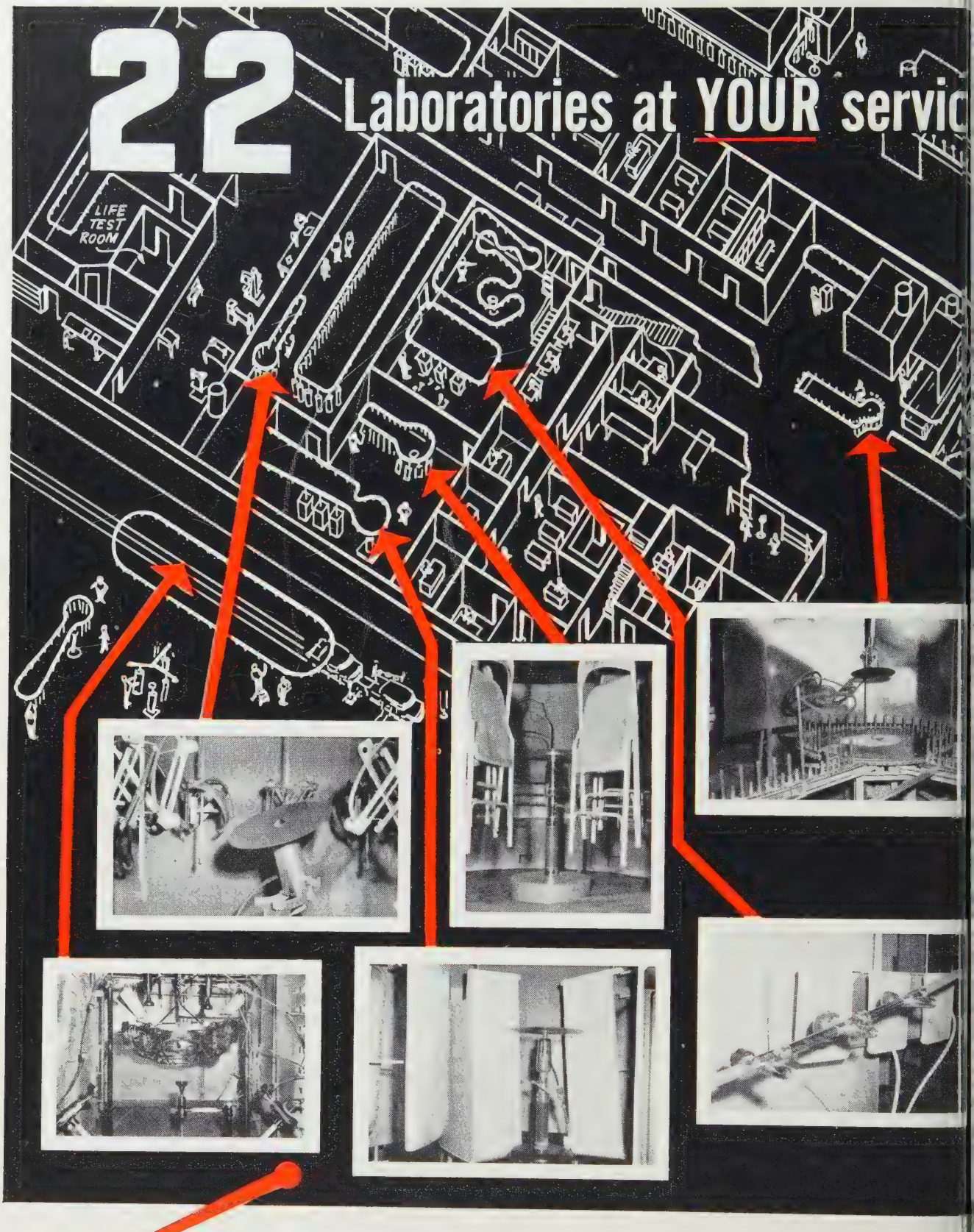
rldwide Research on Ductile Chromium

man—J. W. Dawson, Office of nance Research, U. S. Army. ductory Remarks—Col. P. N. on, Ordnance Dept., U. S. Army. rch on Chromium in America—J. Kroll.
rch on Chromium in Australia Henry L. Wain, Department of ply, Australia.
rch on Chromium in Europe—H. Sully, Fulmer Research Inute, England.

Monday, Oct. 17—2 p.m.

Physical Metallurgy of High-Chromium Alloys

rman—J. H. Holloman, General ctric Research Laboratory.
nce of Chromium Metal Purity the Properties of Chromium Als—Robert I. Jaffee, Battelle morial Institute.
Solubility of Nitrogen and Oxyn in Solid Chromium—A. A. r, Rensselaer Polytechnic Institute.
Ternary System of Chromium-kel Alloy Containing up to 5% rogen—N. J. Grant, Massachuts Institute of Technology.



YOUR JOB, LIKE THESE SHOWN ABOVE, WILL BE TEST PROV

under simulated production conditions to determine co
saving benefits and other advantages. Ransburg also ma
tains other test facilities in Los Angeles, London, Engla
Bad Hersfeld, Germany; Paris, France and Sydney, Austra

prove the painting of YOUR products with

RANSBURG

Electrostatic Painting Processes

Let us make laboratory tests and prove the advantages and cost-saving benefits of painting YOUR products AUTOMATICALLY with one of the Ransburg Electro-Spray Processes.

GET THE FACTS . . . IT COSTS YOU NOTHING!

EP BY STEP—HERE'S HAT YOU GET . . .

- urvey of your plant by Ransburg's perienced field engineers, includ- savings estimate.
- ab painting demonstration of your oducts, using equipment closely ulating your own production con- ions.
- Accurate measurements of paint n thickness.
- Engineering report of detailed ts to determine paint and labor vings.
- Coated samples of your job, lab oduction photos, and even movies desired.
- Detailed drawings of equipment d workholder.

of the above without obligation to you. d, before equipment is installed you eive detailed, pre-installation instruc- ns. Too, a well-qualified, experienced gineer supervises installation and trains ur operator on the job. Ransburg offers ntinuing laboratory and field service to p you with any of your finishing opera- ns.

Ransburg

CTRO-COATING CORP.
Indianapolis 7, Indiana

● **First,** Ransburg sales engineers will make a survey in your plant to check the possibilities of using Electrostatic Spray Painting on your products. Next, you will send samples of your unpainted products—with paint—to the Ransburg laboratories in Indianapolis.

Here, the technical staff takes over. The Ransburg Engineering staff—which includes PH.D's and Masters in Physics, Science, Electrical, Mechanical and Chemical Engineering—makes a complete study of your job. Not only do they have the necessary academic training, but they have the "know how" gained from years of actual experience in the field. Ransburg, you know, was the pioneer in Electrostatic Spray Painting 15 years ago. Engineers and well-qualified technicians have at their disposal every facility for conducting complete tests, simulating your own production conditions. They'll decide which type conveyor is best suited for your job. (There's a conveyorized lab set-up—22 in all—to handle products ranging in size from automobile bodies and chassis to small components, such as window hardware.) They'll design workholders, if necessary, and determine exactly how your job can be run to your best advantage. Details, such as fixture spacing, will be worked out too.

After preliminary studies and tests, you are invited to Indianapolis to see your job run in the lab. If you wish, photos and even movies of your test run can be made and furnished for your own production people to study. You see first-hand what Ransburg Electrostatic Spray Painting can do for you in your own plant.

YOU GET PAINT AND LABOR SAVINGS

Paint usage is accurately measured during the demonstration. The Ransburg No. 2 Process will provide savings up to five times the paint mileage of hand spray. And, one unit can do the work of many hand sprayers. You will see the improved, uniform quality of the work . . . you'll know what kind of increased production to expect, and you can recognize labor savings. ALL OF THIS WITHOUT OBLIGATION.

Ransburg service doesn't end there. After the equipment is installed in your plant—with our supervisory help—we will train your operator and continue to work with your finishing department. Our technically-trained field service engineers are always available to assist with any of your finishing problems.

Briefly, that's our story. Now it's your move. Call or write.

ASM PROGRAM

Oxidation of Chromium and Cr ium Alloys—W. Martin Fasse University of Utah.
The Kinetics of the Formation o Sigma Phase in Chromium-Iro loys—Pol Duwez and Howard tens, California Institute of nology.

Tuesday, Oct. 18—9 a.m.

Chromium

Chairman—A. B. Kinzel, Union bide & Carbon Corp.
Preparation and Properties of I Chromium—I. E. Campbell, telle Memorial Institute.
Electrowinning of Chromium Trivalent Solutions—M. C. sella and J. D. Mettler, El Metallurgical Co.
Melting Point of High-Purity Ch ium—LeRoy L. Wyman, Nat Bureau of Standards.
Mechanical Properties of Ma Chromium—G. Asai and K Deardorf, U. S. Bureau of M
Effects of Impurities on the Duct of Chromium—W. H. Smith A. U. Seybolt, General Electric
Volume Change and Evolution Gases on Heating Electro Chromium—Kenneth A. Moon George A. Consolazio, Watert Arsenal.

Tuesday, Oct. 18—2 p.m.

High-Chromium Alloys

Chairman—P. R. Kosting, Watert Arsenal Laboratories.
Ductile Chromium-Iron Alloys—R Fountain and J. L. Lamont.
Toughness and Mechanical Pro ties of Chromium-Iron Alloys— Kato and E. T. Hayes, U. S. Bur of Mines.
Creep Rupture Properties of Chro um-Nickel Alloys—N. J. Gr Massachusetts Institute of T nology.
A Forgeable Chromium-Iron Ba Alloy—D. P. Moon, H. A. Bl and A. M. Hall, Watertown Arse
Metallography of Chromium Chromium-Rich Alloys—W. Forgeng and G. T. Motock, Un Carbide & Carbon Research La ratories.

POWDER METALLURGY ATOMIC ENERGY

Sponsors: Office of Ordnance Research, U. S. Army; ASM
Chairman: Henry H. Sausner, Sylvania Electric Products Inc.

Thursday, Oct. 20—9:30 a.m.

General Metallurgical Problems the Design of Nuclear Power R actors—Vincent P. Calkins, G eral Electric Co.
Preparation of Metal Powders Nuclear Reactor Purposes—Pre Chiotti and Harley A. Wilhel Iowa State College.
The Latest Developments in t

ROGRAM

of Sintering—Leslie L. Sylvania Electric Products

sday, Oct. 20—2 p.m.

der Metallurgy of Beryllium Zirconium—Harold Hirsch, l Electric Co.

ormation by Powder Metal-—Henry A. Saller and Frank ugh, Battelle Memorial In-

thods of Powder Metallurgy uclear Reactor Purposes— n D. Manly, Oak Ridge Na- Laboratory.

ndling of Pyrophoric and ctive Materials—L. R. Kel- . B. Shuck and R. C. Goertz, ne National Laboratory.

L MEETING, 1955

ls Division, Special raries Association

sday, Oct. 19—7 a.m.

ield trip to Bethlehem Steel ants.

sday, Oct. 19—8 p.m.
Sylvania hotel

Division board meeting.

ay, Oct. 20—9:30 a.m.
Sylvania Hotel

ing Systems in Industrial Libraries

the ASM-SLA System by rial Metallurgists—by E. C. e, Barber-Colman Co.

Coordinate Index System— L. Francisco, General Elec- o.

Memorial Institute Subject System — Robert Gibson, le Memorial Institute.

.m. Powder Metallurgy

Metallurgy Literature and brary—Jean Haime, Fansteel

Metallurgy with Especial nce to the Refractory Metals ry W. Highriter, Vascoloy- Corp.

n. Dinner and social hour.

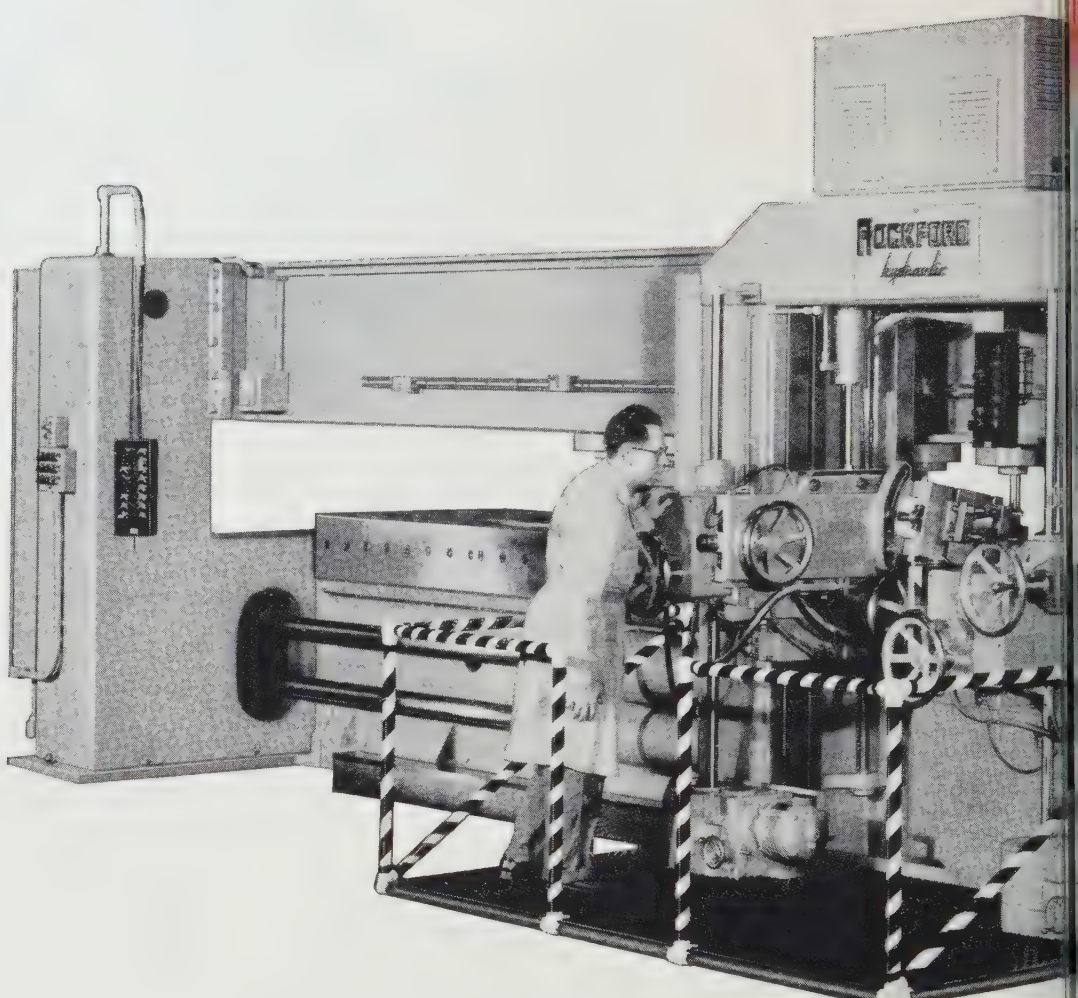
neeting with Philadelphia il of Special Libraries Associ-

Friday, Oct. 21—

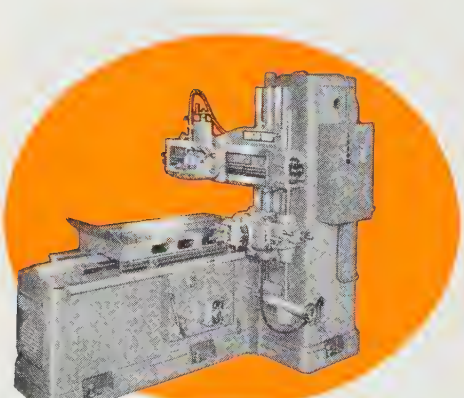
—Field trip to American So- for Testing Materials.

on—Field trip to Franklin ute.

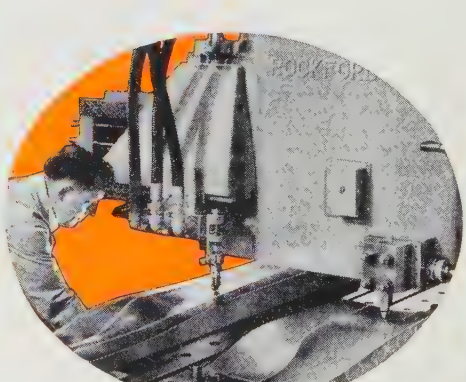
another new hydraulic design.



Hydraulic Openside Shaper



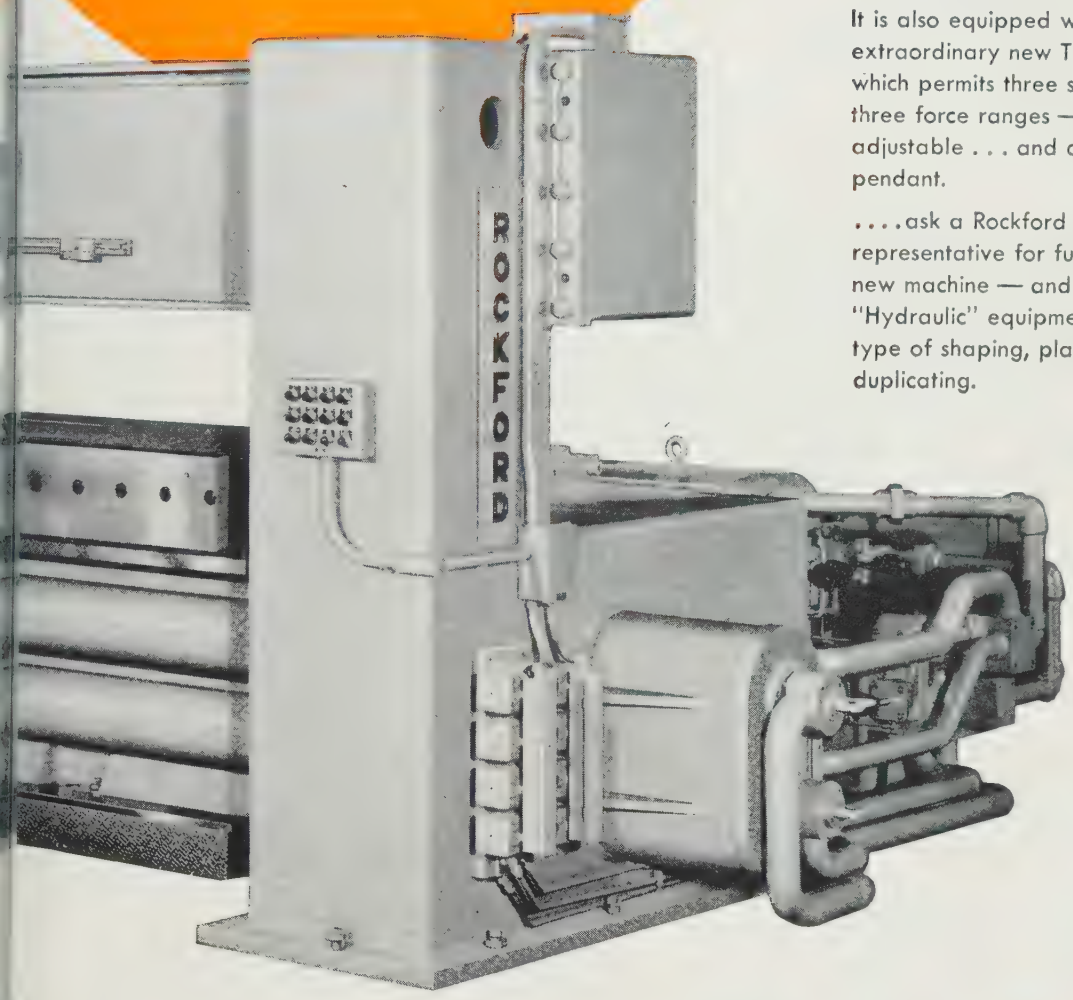
Hydraulic Kopy-Kat Duplicator



Hydraulic Shaper-

plate edge PLANER

with triple circuit!



....the new Plate Edge Planer is one of the latest developments of the Rockford Machine Tool Co.

....it represents the first basic improvement in this type of machine in the past half century.

....the Hydraulic Plate Edge Planer has a working capacity up to 30' wide x 7 inches thick and its saddle reciprocates from 10 to 200 feet per minute. It is also equipped with the company's extraordinary new Triple Circuit . . . which permits three speed ranges and three force ranges — all infinitely adjustable . . . and controlled from the pendant.

....ask a Rockford Machine Tool Co. representative for further details on this new machine — and how modern "Hydraulic" equipment cuts costs on every type of shaping, planing, slotting and duplicating.

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Hy-Draulic

Reg U S Pat Off

American Welding Society

J. H. Humbers
President

Bellevue-Stratford hotel

Monday Afternoon, Oct.

Three Simultaneous Session

CO_2 Gas-Shielded Welding

Carbon-Dioxide Shielded-Metal Welding Process—Robert J. and John P. Koss, A. O. Corp.

Moisture and Its Effects in C Dioxide Welding of Steel—W. Tuthill, General Electric

Electrode Characteristics for W Mild Steel in Atmospheres of bon Dioxide by the Consum Electrode Gas-Shielded W Process—Robert D. Mann Julian D. Carey, General El Co.

Resistance Welding

The Behavior of Spot-Weld Section During Loading—Joh Rudy, Wright Air Develop Center, Roy B. McCauley and ert S. Green, Ohio State Unive

Seam Welding Dissimilar Thic of Low-Carbon Steel—M. L. man and Ernest J. Funk, Uni ty of Texas.

Resistance Spot-Welding Sche for Welding Projection Hard to Mild Steel Sheet and Plat K. Barnes, Westinghouse El Corp.

Weldability and Research

Effect of Preheating on Stress rosion Cracking of Steel Weldm —E. Paul DeGarmo and I. Co University of California.

Heat Treatment of Air Harde Alloys on Welding—John J. Rutherford and John F. Ev Babcock & Wilcox Co.

The Development of High-Te High-Impact Electrodes — G Wepfer, A. O. Smith Corp.

Tuesday Morning, Oct. 1

Three Simultaneous Sessions

Weldability and Research

Further Studies of the Hot Duc of High-Temperature Alloys— nest F. Nippes and Warren F. age, Rensselaer Polytechnic I tute.

Influence of Lattice Structure U Strength Ductility - Tempera Relationships — Julius Heusc

STE

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AWS PROGRAM

The Practical Approach to the ing of Stainless Steel Pr Vessels—Frederick H. Clas Link-Belt Co.

Thursday Morning, Oct.

Three Simultaneous Sessio

Aluminum

Inert Shielding Gases for W Aluminum — James D. Aluminum Co. of America.

Hydrogen Vs. Acetylene Vs. Gas in Welding Aluminum Al J. Koziarski, Piasecki Heli Corp.

Welding Aluminum to Copper Inert-Gas Metal-Arc Process— Cook and M. F. Stavish, Aluminum & Chemical Cor

Piping and Pressure Vesse

Welding of High-Temperature Pressure Piping with Chrome Electrodes—Lloyd C. Nesbitt, al & Thermit Corp.

The Application of Inert-Gas sten-Arc Welding to Carbon Pipe—F. J. Pilia and R. W. M Linde Air Products Co.

Welding Pressure Vessels with matic Submerged Arc—Wilm Weber, Pfaudler Co.

Applications

Automation of Metal Manufactu Requires Correct Use of Arc W ing—H. O. Klinke, Taylor-Wi Corp.

How To Apply Automatic Subme Arc Welding—Robert Wilson, coln Electric Co.

Lower Part Cost by Projection W ing—C. H. Burgston, Deere &

Friday Morning, Oct. 21

Three Simultaneous Session

Brazing

Wettability of Steel with Pure S and Silver Brazing Alloys—M lajs Bredzs, Armour Rese Foundation.

Physical Properties of Butt Jo Brazed with BCu, BAg-1, and B 3 Filler Metals—Grant Hansel Materials & Processes Laborat General Electric Co.

Automatic Blade of High Soli Axial Flow Fans—John B. Hill Sawyer-Bailey Corp.

Maintenance and Cutting

Effective Welding Circuit Mai nance—Donald L. Caldwell, Ca pillar Tractor Co.

Contour Beveling with the Electr Tracer—Howard B. Cary, Mar Power Shovel Co., and R. F. He kamp, Air Reduction Sales Co.

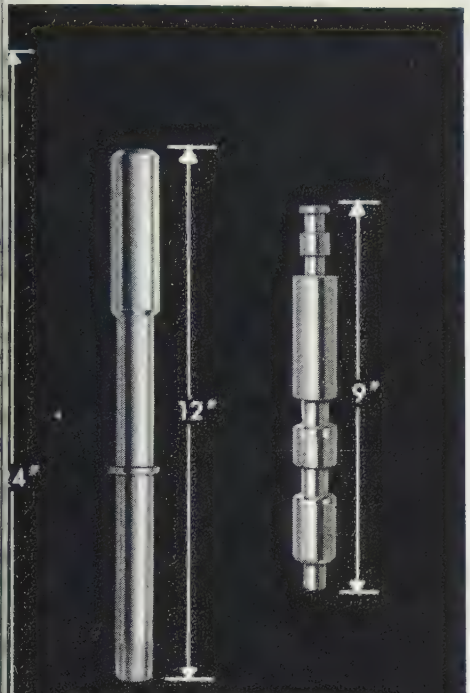
Applications

How To Use Steel Effectively in M chinery — Omer Blodgett, Linc Electric Co.

An Application of the Pressure We ing Process to Fabricate Conti ous Rail—D. C. Hastings, Ri mond, Fredericksburg and Poton Railroad.

Manual Arc Welding of Butt Joi in Crane Rails—Ivan Kutuchief, O. Smith Corp.

impossible to machine long parts AUTOMATICALLY on your present equipment?



Here are some typical examples of work done on this machine. Pieces up to 24" can be handled easily . . . at fast speeds.

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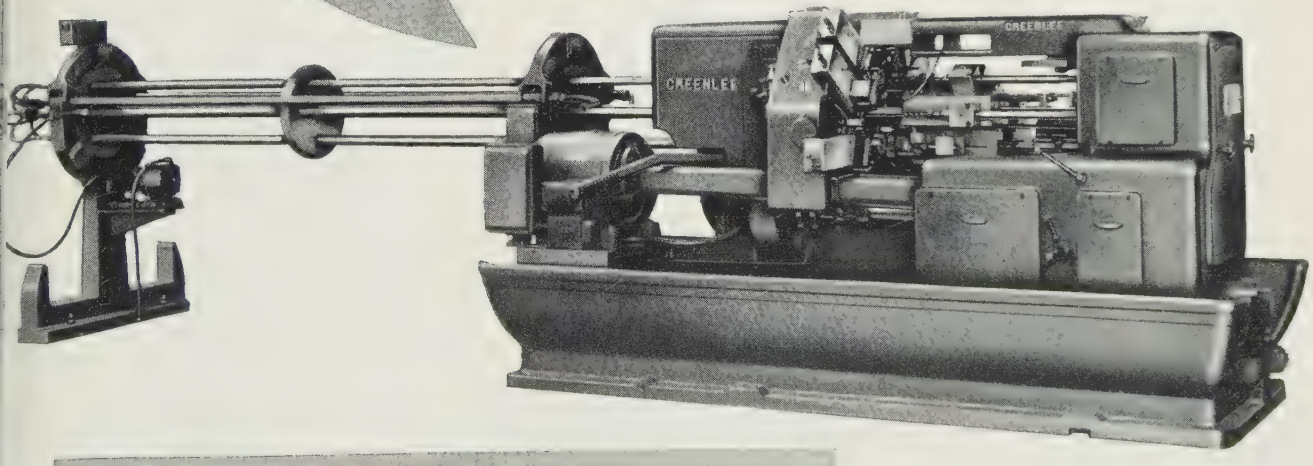
with a GREENLEE SIX-SPINDLE BAR

AIR-FEED AUTOMATIC

This machine puts you in an enviable competitive position. Production goes up . . . costs go down. Check its many advantages: (1) Feeds out stock to 24" (2) Has multiple feed-out (3) Eliminates stock scoring (4) Reduces stock reel noise (5) Eliminates stock pushers and feed-out cams. Especially worth noting is the fact that the stock can be fed out in one or more positions during either the index cycle or feed cycle.

Additional data will gladly be sent on request. Write today.



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Rockford, Illinois

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COMPLETE INFORMATION

Society for Nondestructive Testing

William C. Hitt
President

Hotel Sylvania

Monday, Oct. 17

Educational Survey

Chairman—Samuel A. Wenk, Battelle Memorial Institute.
Co-chairman—Frank Catlin—Magnaflux Corp.

9 a.m. Orientation Lecture—Robert C. McMaster, Ohio State University.
9:45 a.m. Sources of Defects Located by Nondestructive Testing—Clyde E. Betz, Magnaflux Corp.
10:30 a.m. Radiography—Royal Tobey, Eastman Kodak Co.
11:15 a.m. Magnetic Particle Inspection—W. E. Thomas, Magnaflux Corp.
1:30 p.m. Penetrant and Eddy Current Testing—Hamilton Migliaro, Magnaflux Corp.
2:15 p.m. Ultrasonic Inspection—Reflection Testing — John Smak, Sperry Products Inc. Resonance Testing — Peter Bloch, Branson Instrument Co. Immersion Testing—J. B. Mcgan, Aluminum Co. of America.
3:30 p.m. Evaluation of Indications of Discontinuities—James H. Blitz, X-Ray Inc.
4:15 p.m.—Question period

Tuesday, Oct. 18—9 a.m.

Production Testing

Chairman—Richard F. Holste, General Electric Co.
Co-chairman—Charles Tucker, Aluminum Co. of America.

A High-Powered Industrial Fluoroscopic Tube—Donald T. O'Connor, Machlett Laboratories Inc.
Three Electronic Measurement Methods for Metallurgy—Dr. Friedrich Foerster, Reutlingen, Germany.
Eddy Current Inspection in Aircraft Production Applications—Richard Hochschild, University of California.
Field and Laboratory Stress Analysis of Locomotive Components—Ludvig Petersen, Electro-Motive Division, General Motors Corp.

Tuesday, Oct. 18—2 p.m.

Aircraft Inspection

Chairman—John E. Rutledge, McDonnell Aircraft Corp.
Co-chairman—Roderic E. Kleint, North American Aviation.

Management Looks at Nondestructive Testing in Commercial Aircraft Manufacture—Paul Allen, Beech Aircraft.

Delivering semi-finished steel to outside storage by Ross Carrier—
Kaiser Steel Corp., Fontana Works, Fontana, California.

ere's production flow ingenuity...

aiser Steel's 1 2 3 Operation!

A foreman calls for mat-
al over a two-way radio.

2 Immediately a Ross Carrier rushes into action . . . locates the material.

3 Loaded in seconds, the Ross Carrier is on its way to delivery.

No hold-up of production flow at Kaiser Steel. Blooms and slabs of semi-finished steel are rushed at a moment's notice to specialty mills for treatment. Four highly maneuverable Ross Carriers, equipped with two-way radio, have greatly reduced rail hauling within the plant site . . . have made operations between conditioning yards, storage yards and the mills, a fast, *modern* operation.

CLARK® EQUIPMENT

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FREE—a 16-page idea book! Gives you 21 industrial applications of the Ross Carrier—profitable ideas that you can use in your own business. Just tear out this coupon and attach to your letterhead. We'll rush you a copy with no obligation.

SNT PROGRAM

The Relationship of Quality Co to Nondestructive Testing—I Gen. William P. Farnsworth, S Director for Inspection and Qu Control, office assistant secre of defense.

The Application of Nondestruc Testing by a Manufacturer of I tary Aircraft—W. J. Maloney, H child Aircraft Co.

Application of Nondestructive T ing in the Manufacture of Avia Gas Turbine Engines—Fred Rhode, Westinghouse Electric C

Wednesday, Oct. 19—9 a.

Marine Inspection

Chairman—Martin B. Graham Boston Naval Shipyard.
Co-chairman—Frank L. Johnso Bethlehem Ship Building Co.

Radiography of Marine Equipme Willard L. Schwinn and Gilbert Forrer, Babcock & Wilcox Co.

Ultrasonic Testing of Ship Plat Howard E. Dickerman, Portsmo Naval Shipyard.

Nondestructive Testing in Naval C struction—William P. Kelley, B Iron Works.

Radiography of Welds Using P able X-Ray Equipment—G. Beverett Jr., Long Beach Na Shipyard.

Nondestructive Testing in Constr tion of Aircraft Carrier *Saratog* John L. Cahill, New York Na Shipyard.

Wednesday, Oct. 19—2 p.m

Annual Meeting

Chairman—William C. Hitt, National President SNT

Report on Brussels Meeting—Dr. G old H. Tenney, chairman, SNT ternational Relations Committee

De Forest Award (to be announce

Coolidge Award (to be announce

Lester Honor Lecture

The Basis for Standards of Radiati Protection—Dr. Lauriston S. Ta lor, Chief Atomic Radiation Physics Division, National Bure of Standards.

Annual Business Meeting

Thursday, Oct. 20—9 a.m.

Ordnance Inspection

Chairman—Carlton H. Hastings, Watertown Arsenal

Electromagnetic Radiation for Tes ing of Ordnance Products—D Josephy I. Bujes, Naval Ordnan Test Station.

Nondestructive Test Engineering Frankford Arsenal — Maurice Smith and Alfred J. Wysoczansk Frankford Arsenal.

Production Radiographic Inspecti of Propellants—Carl E. Johnso Silas Mason Co., Cornhusker Or nance Plant.

Characteristics of a Closed Link Tel vision X-Ray Inspection System Daniel Polansky and Edward Criscuolo, Naval Ordnance Labor tory.

Betatron Strobo-Radiography—R. A Pulk, Detroit Arsenal.

T PROGRAM

Thursday, Oct. 20—2 p.m.

ting, Forging and Weld Inspection

Chairman—John Delisa,
General Electric Co.
Co-chairman—Clyde B. Jenni,
General Steel Castings Co.

tors Affecting Interpretation of Ultrasonic Indications—Robert H. Lafemeister, Allis-Chalmers Mfg. Co.

metry Influence on Ultrasonic Testing of Large Forgings—Steve Kerabian, General Electric Co.

rasonic Testing of Rail and Railroad Equipment—Dr. Erich Martin, German Federal Railroad.

ndestructive Testing of Lead Linings—Kempton H. Roll, Lead Industries Associates.

ndestructive Testing of Electrical Forgings—F. Howard Oberlin and H. H. Leith, U. S. Steel Corp.

—IHEA—

ace Drever
sident

Industrial Heating Equipment Association

Main ballroom, Convention Hall

Tuesday, Oct. 18—2 p.m.

airman—Alfred E. Tarr, Leeds & Northrup Co.

urnaces, Combustion Equipment and Induction Heating

cuum Melting by Induction and Arc—Frank Chesnut, Ajax Electrothermic Corp.

tch-Type Strip Annealing Furnaces: Multiple and Single Stack —Floyd Olmstead, Lee Wilson Engineering Co.

mbustion and Its Control—Fred Bloom, Bloom Engineering Co.

Wednesday, Oct. 19—2 p.m.

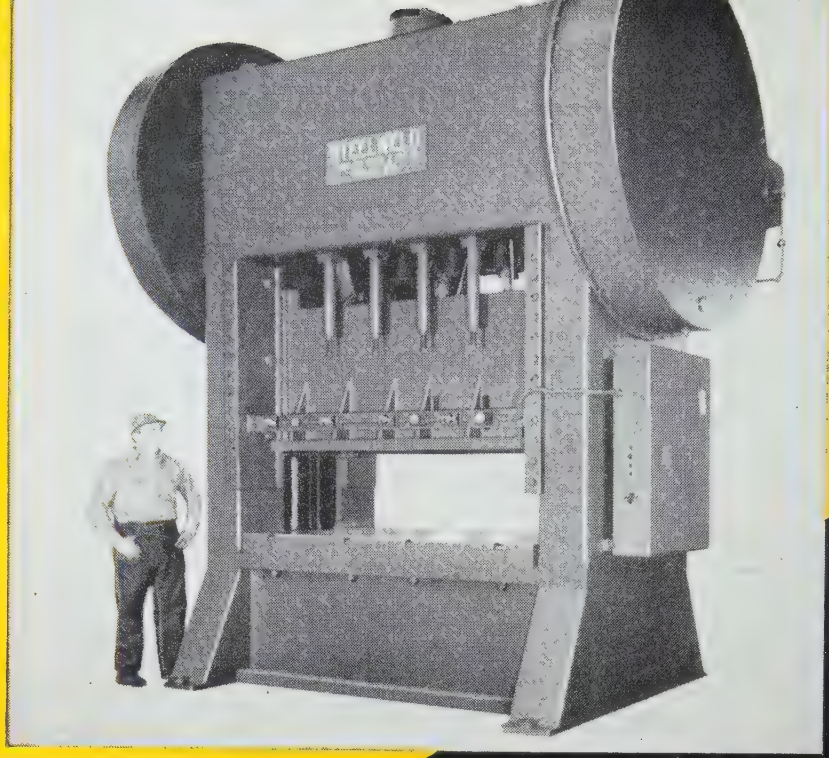
chanized Heat Treating Equipnt and Its Application—Metallurgal Aspects Associated with Induction Heating

chanized Molten Baths — Leon Rosseau, Ajax Electric Co.

chanized Batch-Type Furnaces—Martin Neumeyer, Sunbeam Corp.

chanized Continuous-Type Furnaces—George McCormick, Industrial Heating Equipment Co.

tallurgical Aspects Associated with Induction Heating—Dr. Harry Osborn, Tocco Division, Ohio Crankshaft Co.

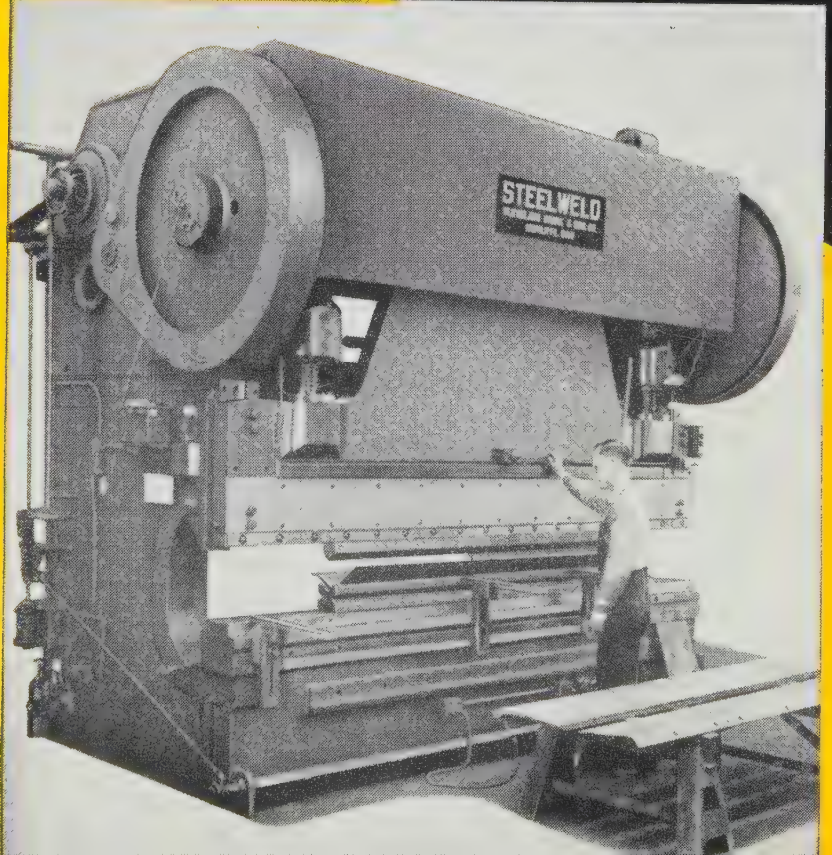


Two-Point Straight-Side Press

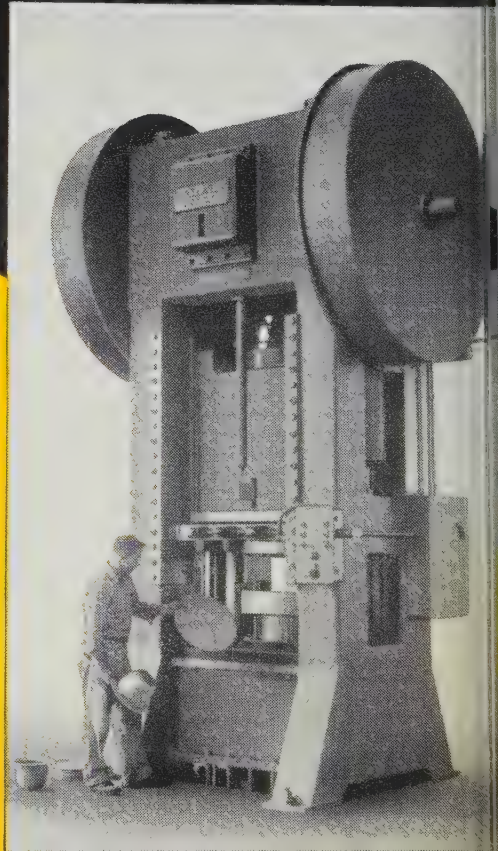
Single-Point Twin-Drive

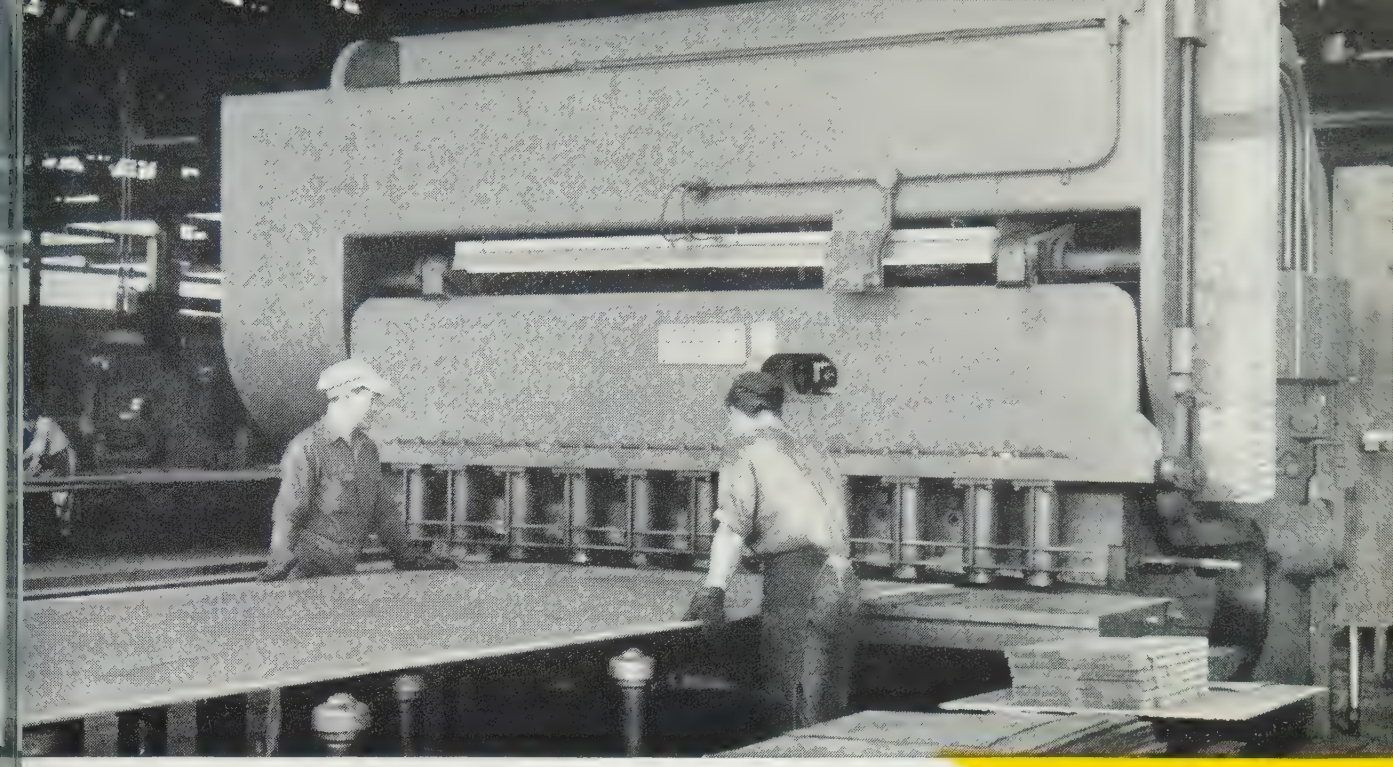
STEELWELD
PRESSES and SHEARS

Steelweld Bending Press



Single-Action Hi-Draw





Pivoted-Blade Shear

A BROAD LINE of Steelweld Mechanical Presses and Shears is available to serve you. All machines are built for heavy duty, continuous operation. Latest features required for high-speed, mass-production runs are provided. Design is generous throughout for long life and low maintenance.

Steelweld forming presses range in size from 150 tons up. Bending presses and shears available for plate thicknesses to 1¼" and lengths to 24'-0".

Descriptive information giving details on any or all of the machines illustrated will be gladly sent upon request.

Representatives in all principal cities

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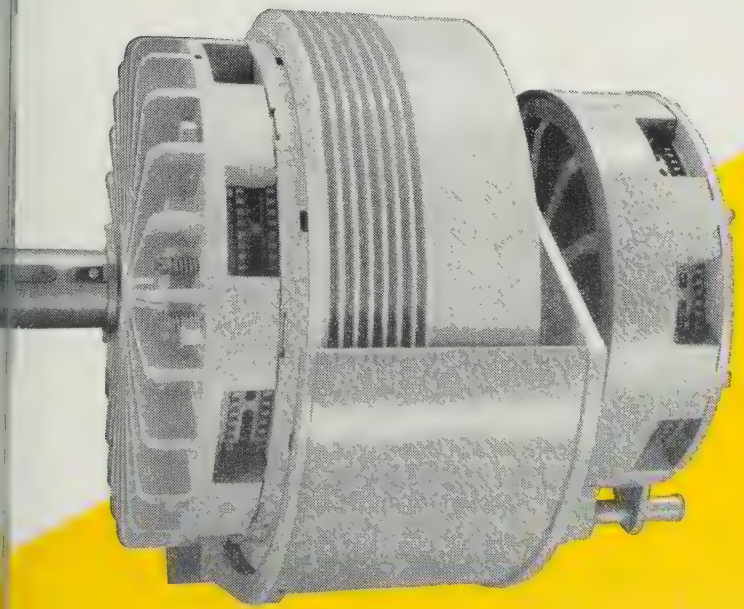
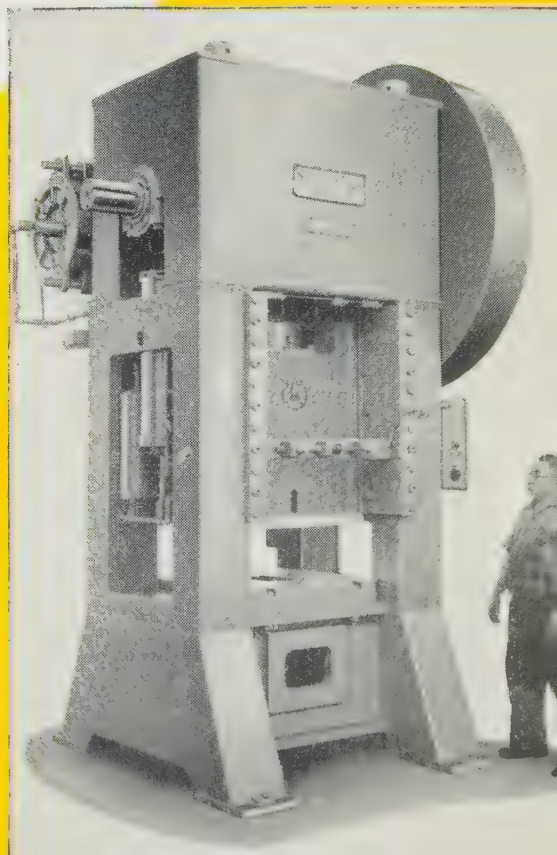




Outstanding Unitized Clutch and Brake

ld's own air-operated design, with rtia and fast heat dissipation, has lly proven under rigorous conditions. Clutch, brake and flywheel are built together as a unit for quick, easy removal or replacement.

Institute of Metals Division AIME

Henry DeWitt Sm
President

Adelphia hotel

Monday, Oct. 17—9 a.m.

Crystal Room

Research in Progress

Chairmen—Paul Gordon and B. S. Lement

Jefferson Room

Deformation (I)

Chairmen—Howard Scott and G. A. Timmons

Internal Friction in Zirconium—W. Bratina, Ontario Research Foundation, and W. C. Winegard, University of Toronto.

Creep of Polycrystalline Tin—J. Breen and J. Weertman, Naval Research Laboratory.

Interaction of Precipitation, Solid Solution Content and Creep in Magnesium-Aluminum Alloys—C. Roberts, Dow Chemical Co.

Tensile Deformation of Germanium Single Crystals—R. P. Carreker Jr., General Electric Co.

Tensile Deformation of Molybdenum as a Function of Temperature and Strain Rate—R. P. Carreker Jr. and R. W. Guard, General Electric Co.

Mechanism of Plastic Flow in Titanium at Low and High Temperatures—F. D. Rosi, RCA Laboratories, F. C. Perkins and L. L. Seigle Sylvania Electric Products Inc.

Strain Rate Effects in Tungsten—J. H. Bechtold, Westinghouse Electric Corp.

Effects of Oxygen, Nitrogen and Carbon on the Ductility of Cast Molybdenum—L. E. Olds and G. W. P. Rengstorff, Battelle Memorial Institute.

Strain-Induced Porosity and Hydrogen Embrittlement in Zirconium—F. Forscher, Westinghouse Electric Corp.

Monday, Oct. 17—2 p.m.

Jefferson Room

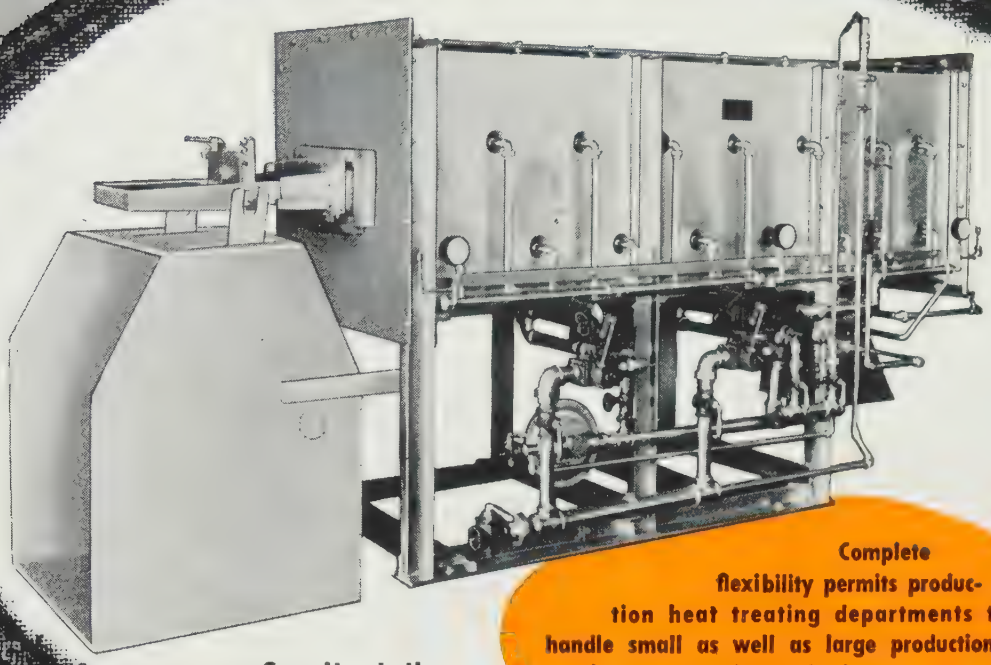
Seminar on Recrystallization and Grain Growth

Chairmen—Bruce Chalmers and J. E. Burke

New RECIPROCATING HEARTH FURNACE

Patent 2,671,654

by AGF Pioneers, the originators and builders of Reciprocating Furnaces since 1921. Features include stationary muffle and complete atmosphere control.



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AIME PROGRAM

Temperature Dependence of Annealing Phenomena in a Cold-Rolled Aluminum Single Crystal—A. Lutts and P. A. Beck, University of Illinois.

Recrystallization Textures of a Cold-Rolled Aluminum Single Crystal—Y. C. Liu, New York University and W. R. Hibbard, Jr., General Electric Co.

Primary Recrystallization Texture in Cold-Rolled Silicon-Iron Crystals—C. G. Dunn and P. K. Koh, General Electric Co.

Preferred Orientations in Rolled and Annealed Titanium—J. H. Keeler and A. H. Geisler, General Electric Co.

Measurement of Grain Growth Rate in Recrystallization—C. D. Graham, Jr., General Electric Co., and R. W. Cahn, University of Birmingham, England.

Grain Growth Rates and Orientation Relationships in the Recrystallization of Aluminum Single Crystals—C. D. Graham Jr., General Electric Co., and R. W. Cahn, University of Birmingham, England.

Crystal Room

Symposium on Nuclear Metallurgy

Chairman—J. H. Frye Jr.

Asst. chairmen—D. H. Gurinsky and A. R. Kaufmann

Plutonium Metal—E. R. Jette, Los Alamos Scientific Laboratory.

Physical Metallurgy of Thorium—F. A. Wilhelm and B. A. Rogers, Iowa State College.

Physical Metallurgy of Uranium—F. G. Foote, Argonne National Laboratory.

Monday, Oct. 17—8 p.m.

Crystal Room

Symposium on Nuclear Metallurgy

Chairman—J. H. Frye Jr.
Asst. Chairmen—D. H. Gurinsky and A. R. Kaufmann

Power Reactors—A. M. Weinberg, Oak Ridge National Laboratory.

Problems in Materials for Atomic Power—J. B. Howe, North American Aviation Inc.

Tuesday, Oct. 18—9 a.m.

Jefferson Room

Seminar on Deformation (II)

Chairmen—Robert Maddin and F. L. Vogel Jr.

Effects of Alloying Elements on Plastic Deformation in Aluminum Single Crystals—E. E. Underwood and L. L. Marsh, Battelle Memorial Institute.

Tensile Creep of High Purity Aluminum—R. W. Guard and W. R. Hibbard Jr., General Electric Co.

Creep of Copper at Intermediate Temperatures—T. E. Tietz and J. E. Dorn, University of California.

Creep-Rupture by Vacancy Condensation—E. S. Machlin, Columbia University.

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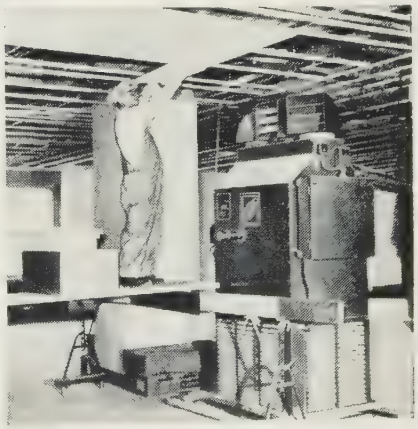

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AIME PROGRAM

Cleavage Steps on Zinc Monocry... Their Origins and Patterns—... Gilman, General Electric Co.
On the Collapse of Dislocation ... During Annealing—Jack ... burn, University of Californi...

Symposium on Titanium

Chairman—L. Shapiro
Asst. chairmen—J. H. Jackso... and L. S. Busch

Keynote address — Dr. Herber... Kellogg, chairman of Titanium ... visory Committee, Office of ... fense Mobilization.
Present Status of Titanium Dev... ment—D. J. McPherson, Ar... Research Foundation.
Panelists:
S. A. Herres, Titanium Metals C...
L. S. Busch, Mallory-Sharon ... nium Corp.
V. W. Whitmer, Republic ... Corp.
D. W. Kaufmann, Rem-Cru ... nium Corp.
Harold Margolin, New York ... versity.
Status of Titanium Fabrication ... Use (a report of the Departm... of Defense, Titanium Steering C... mittee)—J. H. Garrett, office... sistant secretary of defense.
Panelists:
Lt. Col. L. W. Herway, U. S. ... Force.
J. J. Harwood, Office of Naval ... search.
N. L. Reed, Watertown Arsen...
C. B. Voldrich, Battelle Memo... Institute.

Tuesday, Oct. 18—2 p.m.

Crystal Room

Symposium on Titanium

Chairman—L. Shapiro
Asst. chairmen—J. H. Jackson ... and L. S. Busch

The Background for Practical H... Treatment of Various Titanium ... loy Types—P. D. Frost, Batt... Memorial Institute.
Panelists:
W. L. Finlay, Rem-Cru Titani... Corp.
B. Morelander, North Americ... Aviation.
S. Abkowitz, Watertown Arse...
William Rostoker, Armour ... search Foundation.
H. J. Middendorp, Materials La... oratories, Wright-Patterson ... Force Base.
Future Use Pattern for Titanium ... Colonel B. S. Mesick, Retired, ... thur D. Little Inc.
Panelists:
L. Shapiro, Douglas Aircraft Co...
C. W. Alesh, Consolidated Vul... Aircraft Corp.
R. Thielemann, Pratt & Whitn... Aircraft Corp.
V. Kudryk, Chemical Constructi... Co.

Jefferson Room

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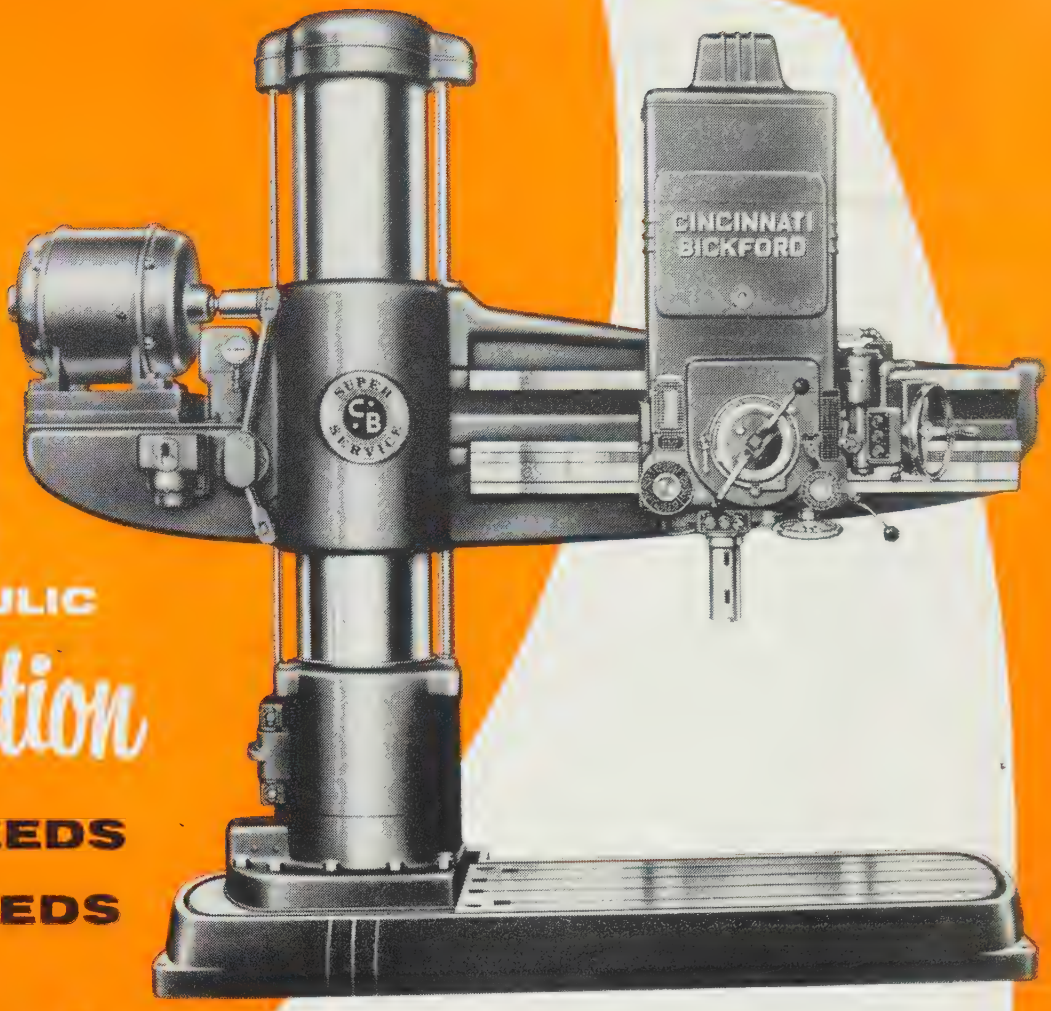

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AIME PROGRAM

Chairmen—C. E. Birchenall a
A. S. Nowick

Diffusion of Nitrogen in Iron—
Busby and Cyril Wells, Carn
Institute of Technology, and
Hart, Pittsburgh Plate Glass

Diffusion in Liquid Lead—S. J. F
man, Argonne National Labora
and L. D. Hall, Stamford Rese
Institute.

Self-Diffusion in Solid Nickel—F
Hoffman, F. W. Pikus and R
Ward, General Electric Co.

Diffusion and Marker Movement
Beta Brass—U. S. Landegren,
Industries Inc., C. E. Birche
Princeton University, and R.
Mehl, Carnegie Institute of T
nology.

Self-Diffusion in Single and P
crystals of Zinc at Low Temp
tures—F. E. Jaumot Jr. and R.
Smith, Franklin Institute.

Some Studies of Al-Cu and A
Solid State Bonding — Sam
Storcheim, Sylvania Electric P
ucts Inc. *Journal of Metals,*
gust, 1955

On the Rate of Sintering—Gerh
Bockstiegel, Sintermetallw
Krebsoge Smett, Germany.

Temperature Gradient Zone Mel
—W. G. Pfann, Bell Telepho
Laboratories Inc. *Journal of Met*
September, 1955

Thermodynamic Properties of S
Iron-Gold Alloys—L. L. Seigle,
vania Electric Products Inc.

A Search for Oxidation-Resistant
loys of Molybdenum—G. W.
Rengstorff, Battelle Memorial
stitute.

Wednesday, Oct. 19—9 a.m.

Jefferson Room

Constitution and General Metallur

Chairmen—D. J. Blickwede and
David Swan

Titanium-Rich Corner of the Ti-A
System—J. J. Rausch and F.
Crossley, Armour Research Fou
ation, and H. D. Kessler, Titani
Metals Corp. of America.

Titanium-Molybdenum-Oxygen S
tem—P. A. Farrar, L. P. Stone a
Harold Margolin, New York U
versity.

Thorium-Columbium and Thorium-
tanium Alloy Systems—O. N. Ca
son, J. M. Dickerson, H. E. Lu
and H. A. Wilhelm, Iowa Sta
College.

System Zirconium-Nitrogen — R.
Domagala, D. J. McPherson a
M. Hansen, Armour Resear
Foundation.

Fabrication of Powdered Thorium
W. W. Beaver, K. G. Wikle a
J. G. Klein, Brush Beryllium

Metallographic Identification of No
metallic Inclusions in Uranium—
F. Dickerson, A. F. Gerds and
A. Vaughan, Battelle Memorial
stitute.

Crystal Room

**Joint Symposium on High-Temper
ature Alloys**

PROGRAM

te of Metals Division of AIME
etals Engineering Division of ASME

airmen—W. R. Hibbard Jr., te of Metals Division, AIME, J. B. Rutherford, Metals Engineering Division, ASME

terials for Use up to 1250° F

Design of Material up to 1250° W. W. Freeman, University of igan.
ty of Alloy Steels—A. B. Wild- National Tube Division, U. S. l Corp.
Practical Aspects of High-Tem- ture Design Below 1250° F— . Chapman, Combustion Engi- ing Inc.

nesday, Oct. 19—2 p.m.

Crystal Room

Symposium on High-Temperature Alloys (continued)

erials for Use Above 1250° F

ples of Design and Develop- t of Alloys for Use Above ° F—N. J. Grant, Massachu- Institute of Technology.
Practical Aspects of Design ve 1250° F—A. W. F. Green, eral Motors Corp.

Jefferson Room

Phase Transformations

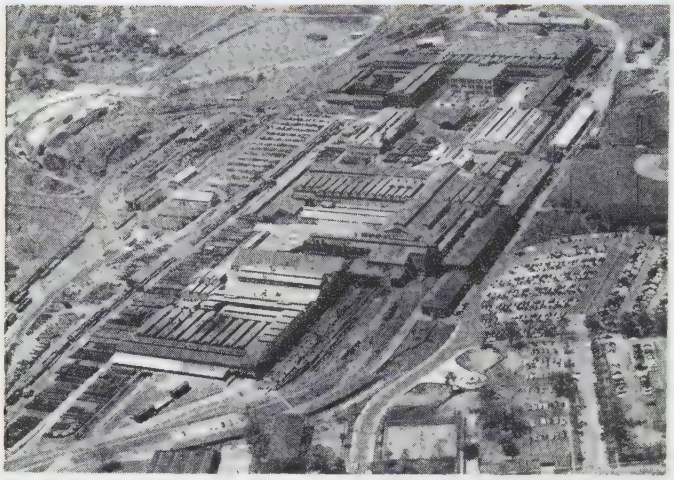
irmen—M. E. Nicholson and W. G. Pfann

Speed Quenching Dilatometer— E. Martin and R. H. Raring, al Research Laboratory.
Treatment and Mechanical perties of Titanium-Iron Alloys C. Holden, H. R. Ogden and . Jaffee, Battelle Memorial Inte.
of Carbon on Some Properties Ti-Mo Alloys—D. W. Levinson, Rostoker and A. Yamamoto, nour Research Foundation.
nability of Titanium Alloys ulated From Composition: A liminary Examination—L. D. e, California Institute of Techgy.
inary Examination of the nching of Titanium Alloys—L. Jaffe, California Institute of hnology.
Nucleation Times in Stainless els—G. F. Tisinai, J. K. Stanley C. H. Samans, Standard Oil (Indiana).
nce for Solidification of a Metaole Phase in Fe-Ni Alloys—R. Cech, General Electric Co.
ogeneous Nucleation of the Marsite Transformation — R. E. h, General Electric Co.
s of Alloying Elements on the ctrical Properties of Manganin e Alloys—D. D. Pollock and I. Finch, Leeds and Northrup

C Embrittlement of Chromized tings on Low Carbon Steel— L. Chu, General Electric Co.

ACIPCO Observes ...

... by looking forward ...



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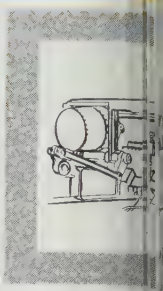

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ladelphia's Convention ll will house all exhibits. exposition opens at 12 n, closes at 10:30 p.m. Monday, Tuesday and dnesday. Thursday and day, hours are 10 a.m. to p.m. Following are exitors and the booths they l occupy.

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Morris Bean & Co., Yellow Springs,
Bede Products Corp., Amherst, O.
Bendix Aviation Corp., South Bend, In
Bendix Foundries, Teterboro, N. J.
Beryllium Corp., Reading, Pa.
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Binks Mfg. Co., Chicago
Black & Decker Mfg. Co., Towson, M
G. S. Blakeslee & Co., Chicago
Bradley Washfountain Co., Milwaukee
Branson Instruments Inc., Stamford, Conn.
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Brush Beryllium Co., Cleveland
Brush Electronics Co., Cleveland
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Chromalloy Corp., New York
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Circo Equipment Co., Rahway, N. J
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Diversey Corp., Chicago
Dodge Steel Co., Philadelphia
Diesel Power Inc., Greenville, Pa.
Dings Magnetic Separator Co., Milwaukee
Drever Co., Bethayres, Pa.
Wilbur B. Driver Co., Newark, N. J.
Driver-Harris Co., Harrison, N. J.
Drop Forging Association, Cleveland
Dunmore Co., Racine, Wis.
E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.

Eaton Mfg. Co., Massillon, O.
Ecco High Frequency Corp., North Bergen, N. J.
Electric Arc Inc., Newark, N. J.
Electric Furnace Co., Salem, O.
Electro Arc Sales Co., Ann Arbor, Mich.
Electro Circuits Inc., Pasadena, Calif.
Elox Corp. of Mich., Clawson, Mich.
Enamelstrip Corp., New York
Engelberg Huller Co. Inc., Syracuse, N. Y.
Empire Products Inc., Cincinnati
Engineered Precision Casting Co., Matawan, N. J.
Ercona Camera Corp., New York
Eriez Mfg. Co., Erie, Pa.
Eutectic Welding Alloys Corp., Flushing, N. Y.
Exomet Inc., Conneaut, O.

Fab-Alloy Co., Jackson, Mich.
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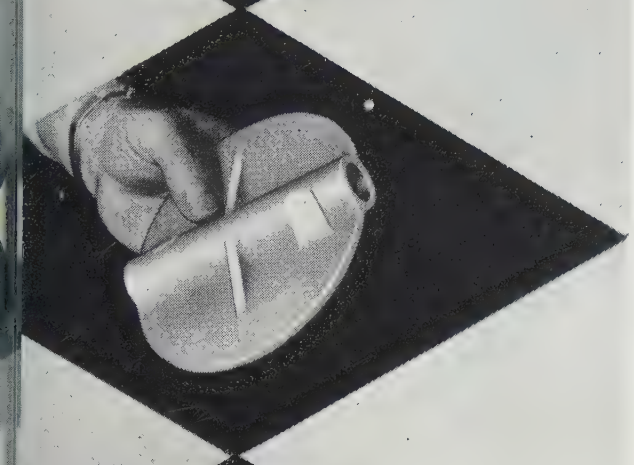

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Mead Specialties Co., Chicago
Merrill Bros., Maspeth, N. Y.
Metal & Thermit Corp., New York
Metal Improvement Co., Los Angeles
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Metals & Controls Corp., Attleboro, Mass.
Metallurgical Inc., Minneapolis
Metalwash Machinery Corp., Elizabeth, N. J.
Minnesota Mining & Mfg. Co., St. Paul
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Modernair Corp., San Leandro, Calif.
Mullins Mfg. Corp., Warren, O.
A. B. Murray, Newark, N. J.

Naresco Equipment Corp., Newton Highlands, Mass.
National Cored Forgings Co. Inc., S. Norwalk, Conn.
National Lead Co., New York
National Precision Casting Corp., Clifton Heights, Pa.
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North American Philips Co. Inc., Mount Vernon, N. Y.
Nuclear Research Corp., Southampton, Pa.

Oakite Products Inc., New York
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Tinius Olsen Testing Machine Co., Willow Grove, Pa.
Optical Film Engineering Co., Philadelphia
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Pangborn Corp., Hagerstown, Md.
Pantex Mfg. Corp., Pawtucket, R. I.
Park Chemical Co., Detroit
Parker Rust Proof Co., Detroit
Pedrick Tool & Machine Co., Philadelphia
Albert W. Pendergast Safety Equipment Co., Philadelphia
Peerless Electric Co., Warren, O.
Pennsylvania Salt Mfg. Co., Philadelphia
Penton Publishing Co., Cleveland
Philadelphia Electric Co., Philadelphia
Phillips Mfg. Co., Chicago
Phoenix Products Co., Milwaukee
Pittsburgh Crushed Steel Co., Pittsburgh
Pneuma-Serve Inc., Cleveland
Porter McLeod Machine Tool Co., Hatfield, Mass.
Precision Metalsmiths Inc., Cleveland
Precision Tube Co. Inc., North Wales, Pa.
Precision Welder & Flexopress Corp., Cincinnati
Pressco Casting & Mfg. Corp., Chesterton, Ind.
Production Machine Co., Greenfield, Mass.
Pyrometer Instrument Co. Inc., Bergenfield, N. J.

Randall Mfg. Co., New York
Ransburg Electro-Coating Corp., Indianapolis
N. Ransohoff Inc., Hamilton, O.
Reed-Prentice Corp., Worcester, Mass.
Reeves Pulley Co., Columbus, Ind.
Reid-Avery Co. Inc., Baltimore
Rockwell Mfg. Co., Pittsburgh
Rollie Mfg. Co. Inc., Lansdale, Pa.
Joseph T. Ryerson & Son Inc., Chicago

George Sall Metals Co. Inc., Philadelphia
A. Schrader's Son, Brooklyn, N. Y.
Sciaky Bros. Inc., Chicago
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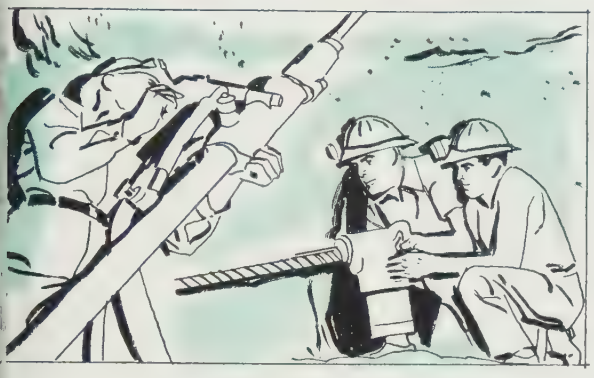
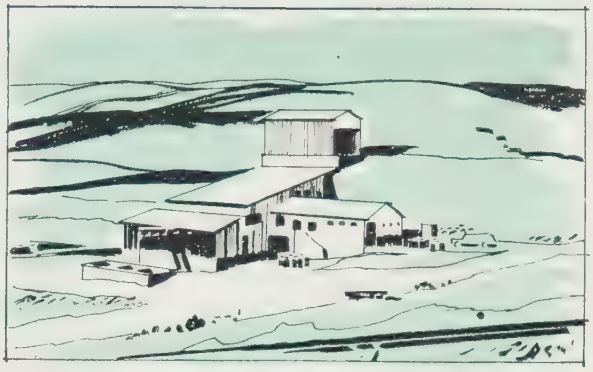
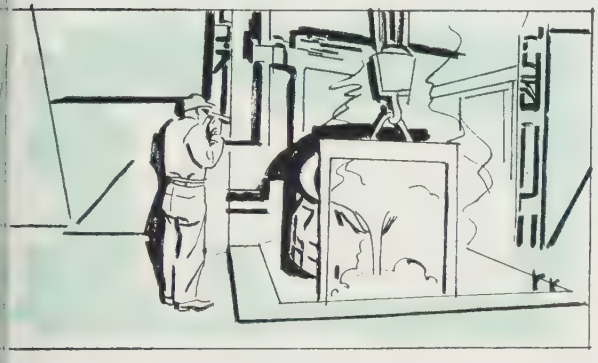


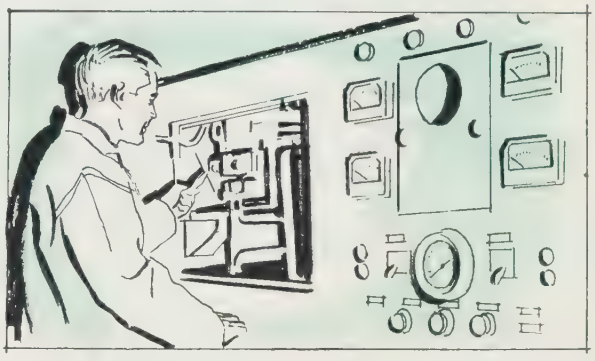
MINING



MILLING



SMELTING



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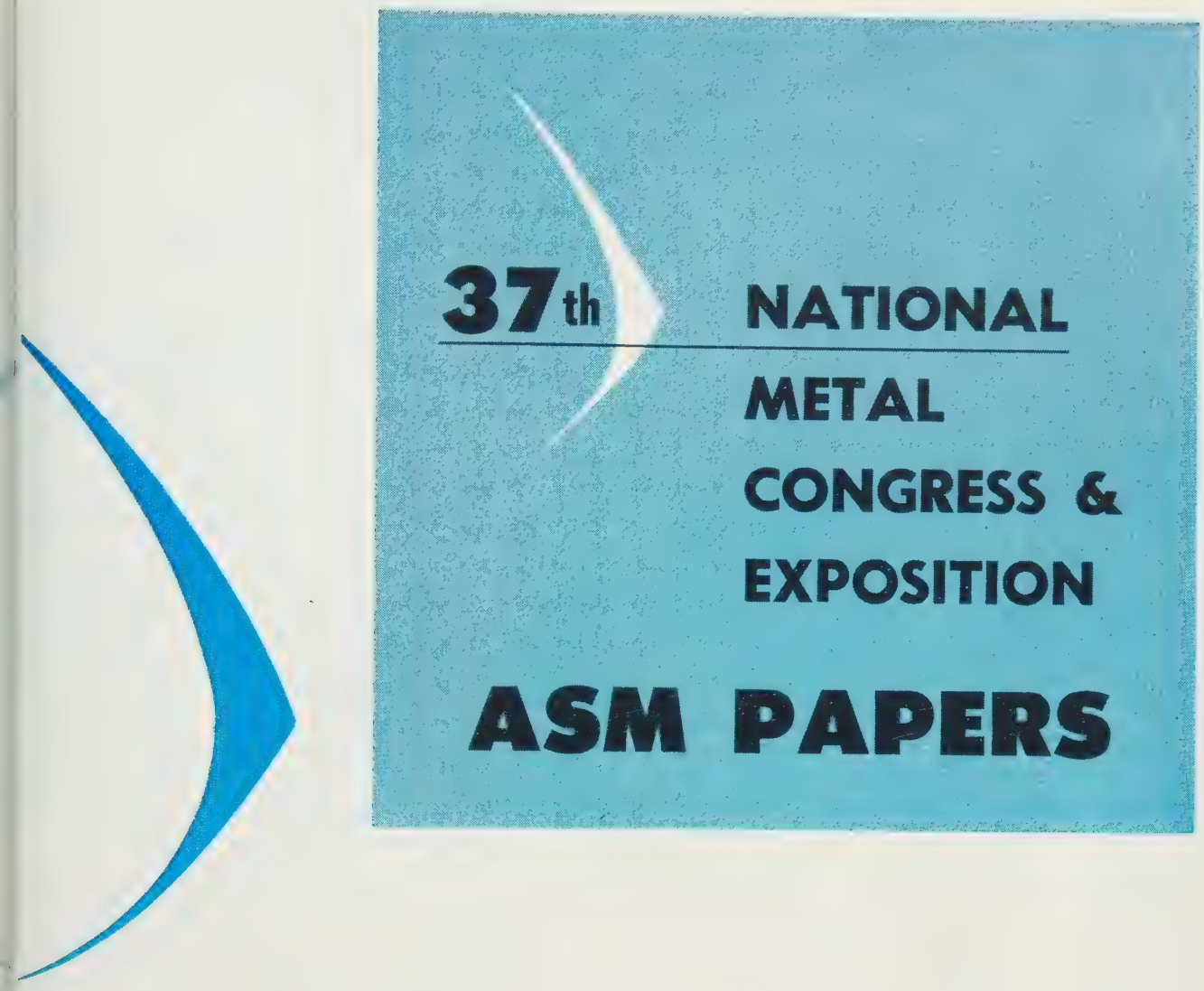

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AINLESS

h Nitrogen Austenitic Cr-Mn Steels—These materials e prepared with special pressure melting and casting hniques. Combining nitrogen-bearing ferroalloys as rging materials and an external pressure of several ospheres of nitrogen gas, sound ingots were cast. y contained about one-half per cent nitrogen (by ght) in solid solution.

he elevated temperature properties of the base composition, 16 Cr-14 Mn-2 Mo-½ N, and several of its modifications, were found to be equivalent to those of the mmercial alloy 16-25-6, in the temperature range of 0 to 1400°F. The hot strength and satisfactory ductility of these alloys, plus the retention of an austenitic rix at elevated temperatures, can be attributed, in e measure, to the unusually high nitrogen content. he alloying elements wolfram (tungsten), silicon, bium (columbium), vanadium and nickel were qualitively appraised for their effect on the creep rupture ngth of Cr-Mn-N steels. None of these elements s found to be superior to molybdenum. While several cent of nickel appear to be beneficial in stabilizing the tenitic matrix at higher temperatures, its presence erely decreases the nitrogen solid solubility.

he room temperature tensile properties of nickel-free, high-nitrogen austenitic steels are characterized by yield, tensile and ductility values generally superior to those of commercial austenitic stainless steels. In the cold-worked state, the alloys have high tensile strength and good residual ductility.

The oxidation resistance of Cr-Mn-N steels appears to be comparable to that of commercial stainless steels of the same chromium content.

Exploratory studies indicate that conventional welding techniques can be used. A possible exception is the inert-gas, shielded-arc process, where nitrogen or mixtures of it and argon must be substituted for the usual inert gas.

Authors: V. F. Zackay, J. F. Carlson and P. L. Jackson

Influence of Strain Rate and Temperature on Ductility of Austenitic Stainless Steel—The ductility of AISI 303 and 310 was determined in tensile tests over a range of strain rates from 0.01 in./in./min up to 19,000 in./in./min, and over a range of temperatures from −321°F up to +750°F.

Ductility drops as the strain rate is increased, being greatest at room temperature. The ductility shows a maximum at room temperature at a low strain rate, but

at high strain rates it increases slowly with the test temperature.
Authors: G. W. Form and W. J. Baldwin Jr.

Notch Ductility of Type 410 (12% Cr) Stainless Steel—The influence of composition and heat treatment variables on the notch ductility of this material was investigated. Sharp crack tests of large specimens were used to establish the temperature range of transition from notch-ductile to notch-brittle behavior, and correlation was established with results of conventional Charpy V tests.

Sharp crack tests demonstrated that conventional-type 410 steels (normalized and tempered to tensile strength of 90,000 psi) are susceptible to brittle fracture at warm service temperatures.

The addition of about 0.70 per cent Mo and Ni and the lowering of silicon from the normal 1.0-1.2 per cent to about 0.50 per cent result in material which is highly resistant to brittle fracture at low temperatures.

It is concluded that the brittle failures of type 410 castings may be prevented by use of improved material.
Authors: F. A. Brandt, H. F. Bishop and W. S. Pellini

Creep Rupture Properties of Cold Worked, Type 347 Stainless Steel—This columbium stabilized stainless was cold worked up to 60 per cent. Recrystallization temperatures were determined for ½, 5 and 50-hour intervals.

In addition to tensile testing at room temperature, creep rupture tests were performed at 1200, 1300, and 1500° F to study: 1. The effects of cold work on the high temperature properties. 2. To relate the time-temperature values for the incidence of intercrystalline fracture to the static recrystallization temperature.

Static recrystallization studies and creep rupture tests confirm that recrystallization can come at a temperature 200°F lower during creep rupture than in static tests.

Useful high temperature strengthening in creep rupture can be achieved through cold or warm work as follows:

1. At 1200°F, up to 30 per cent cold reduction yields improvement up to at least 1000 hours.
2. At 1300°F, up to 10 per cent cold reduction for a 1000-hour life and over 30 per cent for 1-hour life or less.
3. At 1500°F, up to 20 per cent cold reduction for a 1-hour life but avoid cold work for rupture

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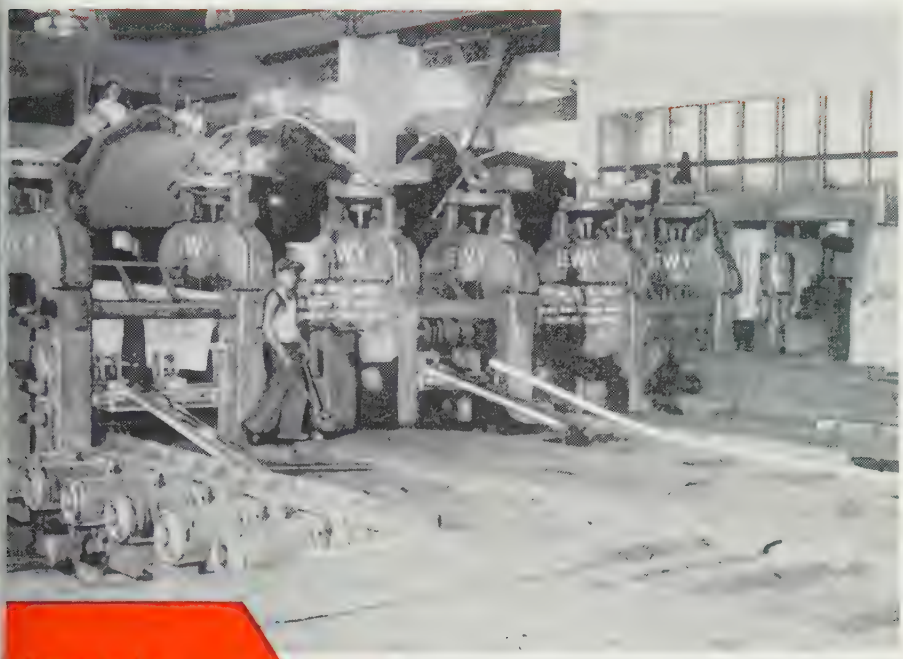

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lives of greater than about 1 hour (the solution treated condition is best).

4. At 1100°F and lower, it appears that significant improvements can be achieved for long time use with cold work up to 30 per cent or more.

Authors: N. J. Grant, Albert G. Bucklin and Warren Rowland

Influence of Alloying Elements on Impact Transition Behavior of 12% Cr Steels Aged at 900° F—The effect of varying amounts of carbon, chromium, molybdenum, aluminum and titanium upon the V-notch Charpy transition temperature of this material (aged for 10,000 hours at 900° F) was determined.

Higher (0.08 per cent) carbon content favored slightly lower transition temperatures for AISI type 410 steels in the annealed condition. An increase in transition temperature was observed for all combinations of carbon and chromium contents after aging for 10,000 hours at 900°F.

Contrary to published information, 0.25 per cent aluminum (AISI type 405) appeared to have no influence on the transition temperature. While the addition of 0.50 per cent molybdenum minimized the increase in transition temperature, the combined addition of molybdenum and aluminum appeared to eliminate it entirely.

A grain boundary network of fine lamellar precipitate, which appeared to be carbides and/or nitrides, was present in every case with an increase in transition temperature.

Authors: E. J. Whittenberger and E. R. Rosenow

Effects of Chemical Composition and Heat Treatment Upon Microstructure and Corrosion Resistance of AISI Types 309 and 310—These stainless types, with varying carbon and nitrogen content, were subjected to different solution annealing treatments and cooling rates. Corrosion tests were conducted in boiling 65 per cent nitric acid and copper sulphate-sulphuric acid.

Type 310—Excellent correlation was observed between distribution of carbides and corrosion resistance in both tests.

The best resistance to corrosion after slow cooling from the solution annealing temperature was obtained when the microstructure contained a random distribution of undissolved carbides which acted as nuclei for the carbon precipitation.

When the microstructure prior to solution annealing contained intergranular carbides or when the carbides were completely dissolved during solution annealing, the steel became susceptible to intergranular corrosion after slow cooling from the solution annealing temperature.

When the carbides were randomly dispersed and when the solution annealing temperature was such that only about 50 per cent of the carbides were dissolved, corrosion resistance of the 0.16 per cent carbon type 310 steel was equal to that of the 0.06 per cent carbon type 310 steel after slow cooling from the solution annealing temperature.

Type 309—A fair correlation was observed between the distribution of carbides and corrosion resistance in boiling 65 per cent nitric acid and copper sulphate-sulphuric acid. Banding and segregation of carbides were more prevalent in the type 309 steel than in type 310. This, in turn, affected somewhat the correlation between the grain boundary carbides and corrosion resistance.

At the low or commercial nitrogen levels tested, improved corrosion resistance was obtained in type 309 with a low solution temperature which resulted in only partial solution of randomly distributed carbides. In this respect, the data were similar

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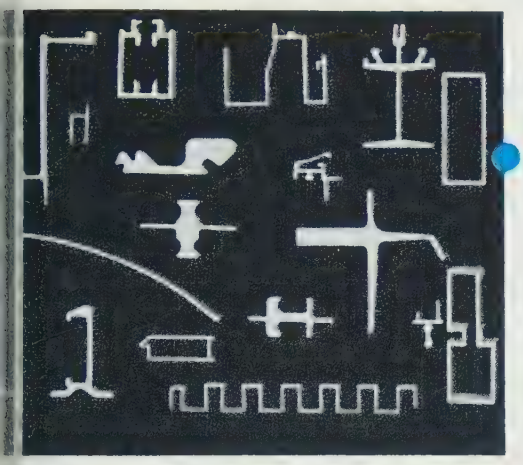

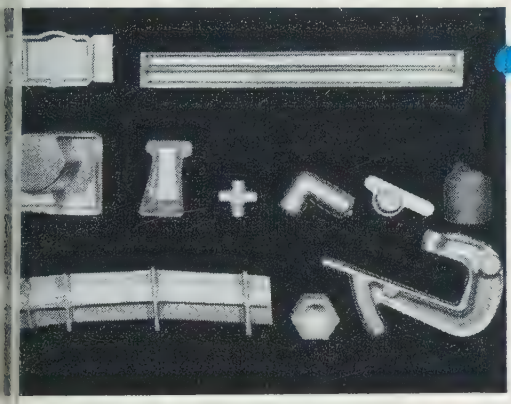

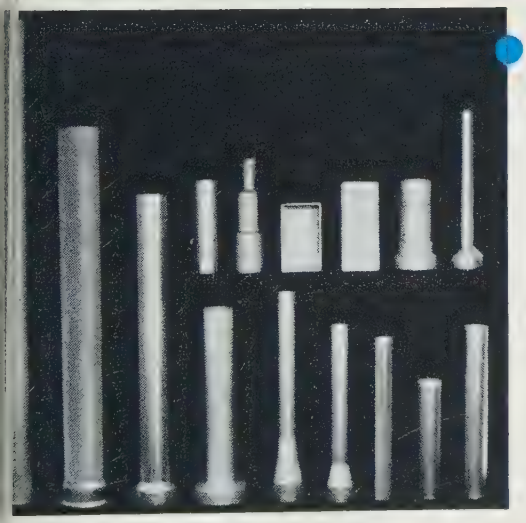

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to those of type 310. With the hi[gh]er nitrogen levels, the low solut[ion] temperatures did not greatly i[m]prove corrosion resistance when sl[ow] cooling rates were used from [the] solution temperature.

Increasing the nitrogen content [of] the low (0.06 per cent) carbon ty[pe] 309 heats appeared to be benefic[ial] in increasing intergranular cor[ro]sion resistance. However, increasi[ng] the nitrogen content at the hi[gh] (0.16 per cent) carbon level had lit[tle] effect on the intergranular corrosi[on] resistance of the type 309 steels.

In type 309 steels, if rate of co[o]ing from the solution annealing te[m]peratures is slow, adjustment of t[he] composition to produce 20 per ce[nt] delta ferrite will markedly impro[ve] intergranular corrosion resistance [by] minimizing intergranular carbide pr[e]cipitation. However, in some cas[es] severe embrittlement was observe[d] in type 309 containing a higher pe[r]centage of delta ferrite.

Authors: D. J. Carney and E. [J.] Rosenow

VANADIUM

Properties of Vanadium Consolidate[d] by Extrusion—Extrusion is a feasib[le] technique for consolidating ducti[le] vanadium *reguli* produced by th[e] bomb reduction of V_2O_5 with calciu[m]. Simultaneous consolidation and shap[e]ing of vanadium by extrusion result[s] in a dense, sound product with satis[-]factory mechanical properties and ex[-]cellent cold fabrication characteris[-]tics. Contamination of the reactiv[e] vanadium with oxygen and nitroge[n] during processing is minimized.

The tensile properties of the ex[-]truded vanadium are similar to thos[e] of ingot iron; they are characterize[d] by moderate strength and high ductil[-]ity. The ductility of the extrude[d] product is further demonstrated b[y] the excellent cold fabrication charac[-]teristics in tube drawing.

The temperature range of soften[-]ing for extruded vanadium, which was cold reduced 60 per cent in area and annealed 1 hour, is 932 to 1652° F. Metallographically, recrys[-]tallization occurs between 1382 and 1652° F. An anomaly, attributed to age hardening, is in the softening curve between 1112 and 1472° F.

Authors: C. E. Lacy and C. J. Beck

Mechanical Properties of Vanadium-Base Alloys—In its unalloyed form, vanadium may be regarded as a low-strength, ductile metal. Its ductility, as in titanium, zirconium and other high-melting point transition ele-

.ts, is severely limited by the con- of interstitial elements—oxygen nitrogen—held in solid solution. ccordingly, melting and heat tments must be designed to pre- any increase in the existent l of interstitials. Because of this because of its high melting point 2° F), it would seem that van- m and its alloys will have to be ed in the cold-mold, arc-melting aces in use for titanium and bnium alloys.

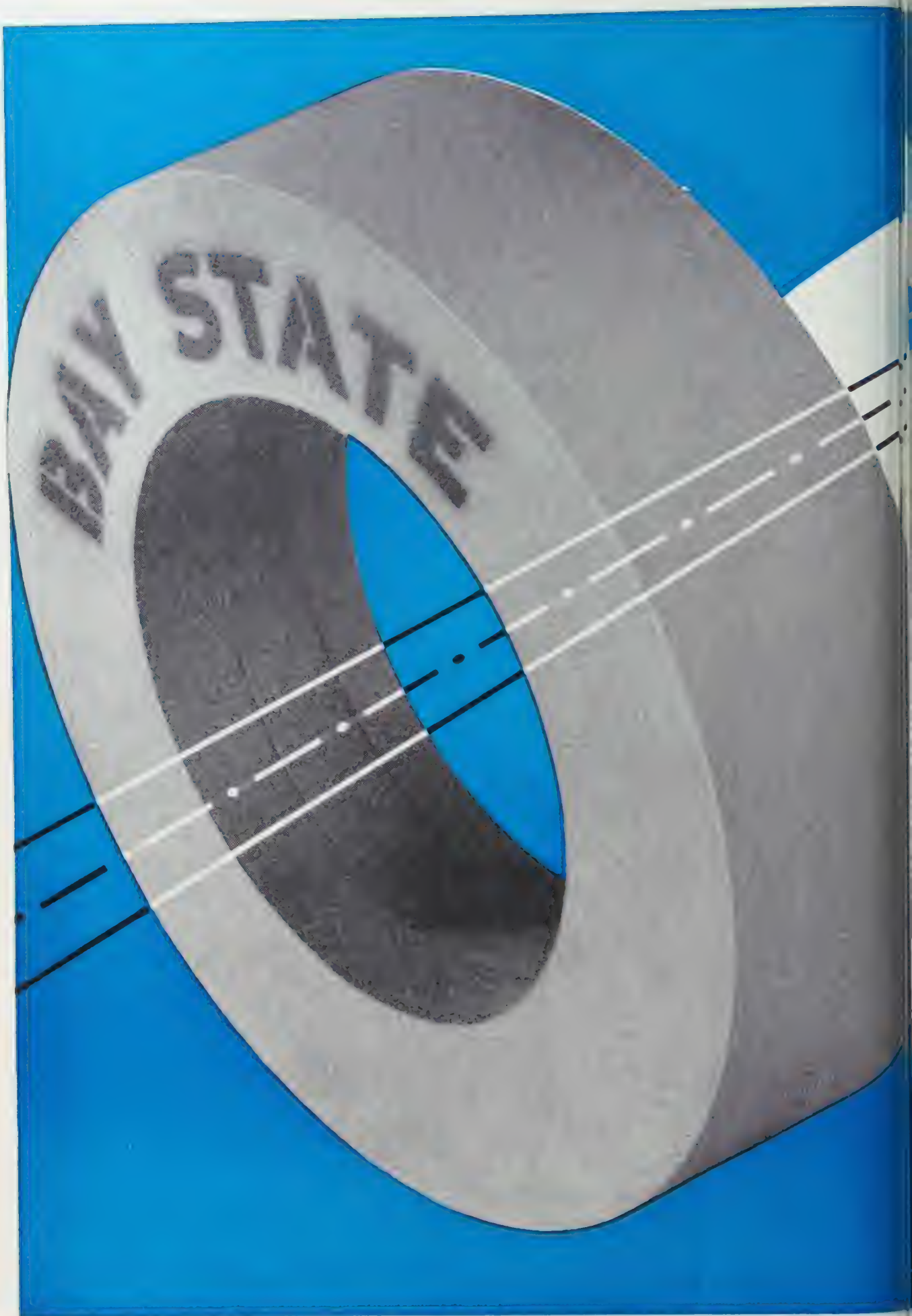
lthough a large number of ele- ts have appreciable solid solubili- in vanadium, only one of the ry systems, vanadium-titanium, nits forgeability beyond 10 per alloy addition. The V-Ti alloys forgeable over the whole range of positions.

ertain elements in small additions lop anomalous minima in hard- and tensile strengths which in e instances are significantly lower n unalloyed vanadium. Titanium zirconium are particularly re- kable in this respect. An alloy aining 2.5 per cent Zr has con- rably more tensile ductility than lloyed vanadium. A sheet speci- cold rolled to more than 90 per reduction in area can still be over a sharp mandrel to nearly degrees.

early all the forgeable binary ys have low tensile strengths and igible tensile ductilities. Out- nding exceptions are binary alloys aining up to 50 per cent Ti and o 3 per cent Zr. The goal of high- ngth and high ductility can be eved only in polycomponent al- based on vanadium-titanium and adium-zirconium.

esting showed that only the V- K alloys, where X is a third addi- or more, could develop high ngth levels. Single-phase solid tion alloys based on V + 40-50 cent Ti can develop room temper- e strengths up to 170,000 psi.

While the over-all strength of un- yed vanadium is relatively low, rate of decrease with temperature lso low, with the result that even 1652° F, vanadium retains ngths of about 15,000 psi. Judged a strength to density basis (den- of vanadium is 6.0 grams per cc), is nearly equal to molybdenum. systematic program of hot ten- testing of vanadium alloys wed that the elevated tempera- e strengths in the range of room perature to 932° F could be raised substantially higher levels than se shown by unalloyed vanadium. or instance, unalloyed vanadium


BAY STATE

at 932° F has a tensile strength 57,000 psi. An alloy containing per cent Ti and 5 per cent Si had strength of 158,000 psi. Above 93 F, all alloys showed sharp progressi drops in strengths converging nea 1652° F. At this temperatur strengths vary between 15,000 a 50,000 psi. It would appear that about 2012° F, all alloys would ha about the same strength.

The excellent high temperature te sile strengths were taken as a pr liminary indication of useful cre strengths, especially when judged a strength to density basis. T stress-rupture behavior of a numb of alloys was studied in the tempe ature range 932-1292° F. Alle groups included V-Ti-Cr, V-Ti-Al a V-Ti-Al-C, as well as alloys of V-T Al using alumino-thermic vanadiu as an alloy base.

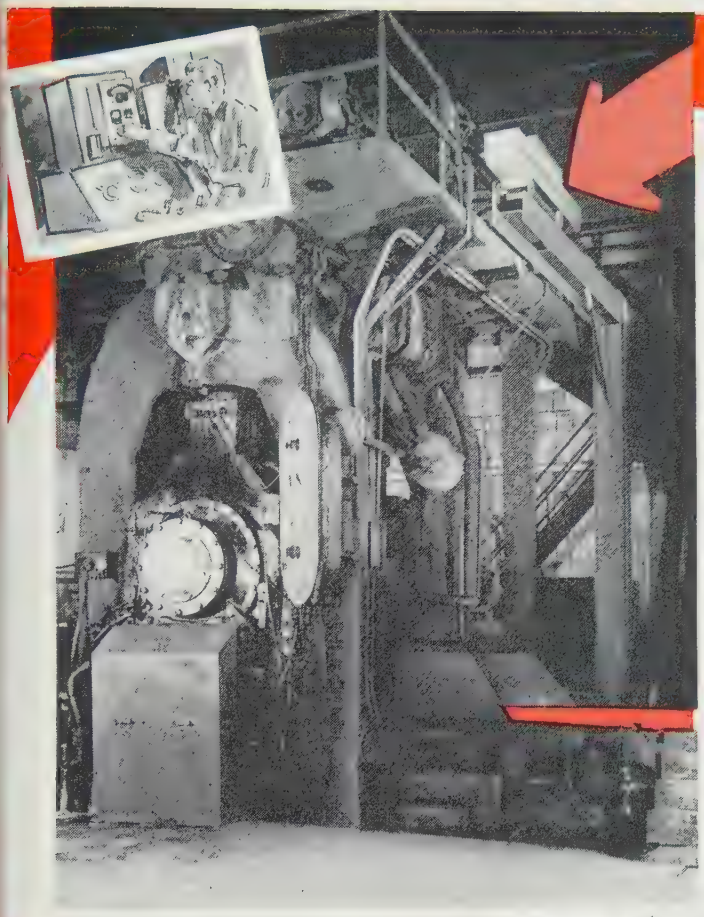
Certain vanadium alloys were d veloped which were at least equ and probably marginally superior, the best so far developed in tit nium-base alloys. In the temperatu range 752-932° F, there is an unque tioned superiority of the vanadiu and titanium alloys over the nick base, cobalt-base and iron-base allo when judged on a stress-to-ruptu by density parameter.

Carbon additions have been sho to improve the forging characte istics of vanadium alloys without i pairing mechanical properties. certain instances, carbon additions d veloped superior ductilities. The pre ence of free carbides does not see to affect the stress-rupture behavi

The majority of this work ma use of vanadium metal produced a calcium reduction process. Th metal is of comparatively high pu ty and is ductile in the unalloy state. A new vanadium metal, pr duced by an alumino-thermic redu tion process, is currently available.

This metal contains appreciab amounts of aluminum in solid sol tion as well as a higher level of i terstitials. Accordingly, it is not du tile in its unalloyed state. Howeve it was shown that when the alumi thermic metal was used as base m terial to prepare the V + 40-50 p cent Ti + 5-10 percent Al allo the alloys were similar in mechani behavior to the same composition produced with calcium-reduced va adium.

Vanadium alloys have potential a plication as high strength materia at elevated temperatures up to 125 F, at which temperature V_2O_5 me and catastrophic oxidation occu Above that temperature suitable o



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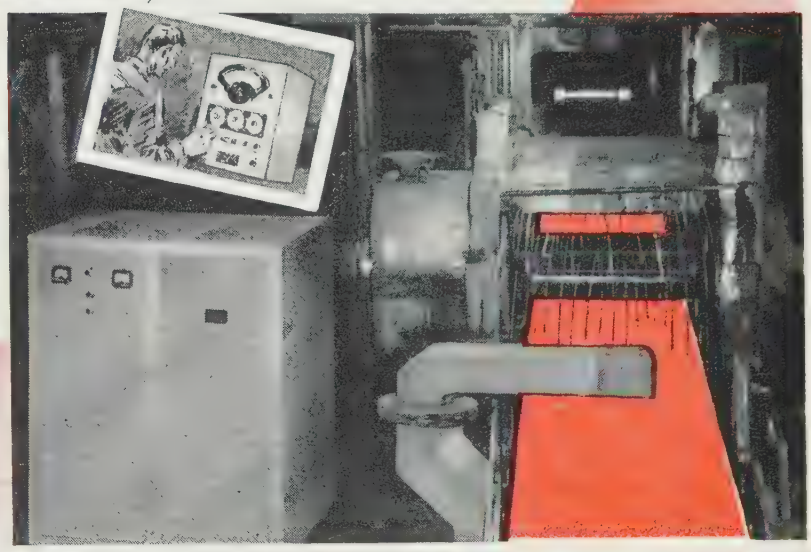

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dation preventive measures are necessary. The work reported here is of a preliminary nature, but it serves to define areas of interest for further investigation.

Authors: W. Rostoker, A. S. Yamamoto and R. E. Riley

ZIRCONIUM

Tensile Properties of Zirconium-Chromium Alloys: Particle Strengthening Effects—Zirconium, with its low neutron absorption, high temperature of melting and good corrosion resistance, is of interest to the Atomic Energy Commission for use in reactors. It is desirable to raise its strength at elevated temperatures and at the same time maintain its low neutron absorption and good corrosion resistance as much as possible. Chromium is one of the alloying elements that might be used with zirconium because of its relatively moderate neutron absorption (2.9 barns) and known ability to impart elevated-temperature strength and oxidation resistance to other metals.

Tensile properties of zirconium-chromium binary alloys containing to 18 atomic per cent chromium w investigated for the temperat range 382 to 932° F. Highest y strength obtained at 932° F about 26,000 psi (for the 18 cent chromium alloy). No sign cant solid-solution hardening in al zirconium hardening was observed linear relation between the f stress and volume fraction of compound was observed.

The particle-hardening effect creased with strain in the range true strain 0.002 to 0.05, and m a greater total strengthening cont bution at lower temperatures. T normalized (per cent) increase strength was essentially independe of testing temperature except at t highest temperature where the allo showed signs of instability.

Author: J. H. Keeler

Progress in Development of Creep-Resistant Zirconium Alloys — T eutectoid-type alloying elements, m lybdenum, niobium (columbium tantalum and vanadium, are most e fective in strengthening zirconiu at temperatures below 932°F. T peritectoid-type alloying element aluminum and tin, are most effecti in strengthening zirconium at tem peratures above 932°F. The perite toid-type alloying elements are al most effective in improving the cree strength of zirconium at 932°F.

Those ternary zirconium allo that contain both peritectoid an eutectoid-type alloying elements ha been called peritectoid-eutectoid h brids. These alloys show an extrem ly wide range of mechanical prope ties and are noted for the ease wi which they can be hot fabricate Alloys of this type exhibit goo strength and ductility at room tem perature, and show promise for th development of creep-resistant a loys at 932°F.

The peritectoid-eutectoid hybri are heat treatable, and can b strengthened by heating into an quenching from an alpha-plus-be or beta-phase field. This strengthe ing effect is usually associated wit a severe loss in ductility.

Author: W. Chubb

TITANIUM

Mechanical Properties of Ti-Cr-Al Alloys as Affected by Grain Size and Grain Shape—For unalloyed titanium grain size or shape has only a mino effect on the mechanical propertie Yield strengths are decreased sligh ly for specimens annealed in th

-beta range because of the par- of impurities to the nonmatrix . Impact resistance is highest the smallest alpha-grain sizes. ductility and tensile ductility excellent for all grain sizes. The e endurance limit at 10^7 cycles per cent of ultimate strength for tched and 42 per cent for notched mens.

e grain size of the metastable- alloy (Ti7, 5Cr-7.5Mo) also has a minor effect on the mechanical erties so long as the alloy is e phase. The presence of alpha e structure lowers the bend duc- , tensile ductility and impact tance. Notched fatigue proper- appear to be relatively unaffect- changes in grain size or micro- tural condition. The plates of phase in the beta matrix act as s raisers similar to notches and the unnotched endurance limit e alloy.

e alpha-beta alloy (Ti-2.5, Cr-2.5 was tested in the stabilized con- so that the only variables would rain size and shape. Only minor ges in properties occurred as a t of changing the alpha-beta size. Strengths were unaffected hanging grain shape, although equiaxed alpha-beta specimens higher tensile ductilities and im- resistance than the acicular a-beta specimens. The fatigue rance limits generally were un- ted by grain size or shape. The tched fatigue strength was 34 cent of the ultimate tensile gth, and the notched fatigue gth was 20 per cent of the ul- te tensile strength.

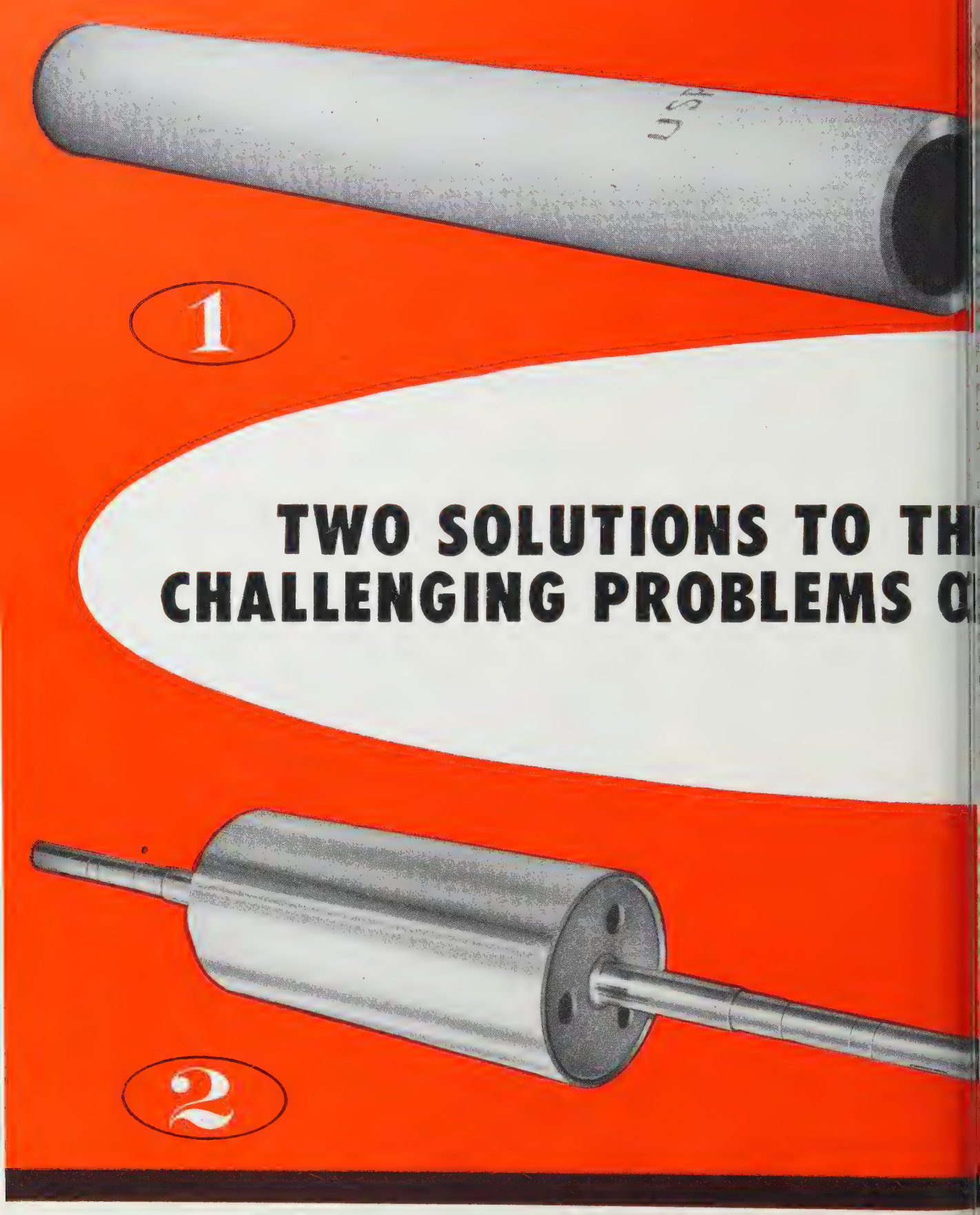
e fatigue endurance limit of the s appears to be unchanged, re- less of alloy content, although tensile strength is greatly in- sed as a result of alloy content. fatigue endurance limit of tita- a, at least for rotating-beam tests, ably will not be increased great- y alloying.

hors: H. R. Ogden, F. C. Holden R. I. Jaffee.

rogen Contamination in Descaling Acid Pickling of Titanium— aling and pickling operations e investigated as probable sources ydrogen contamination. Prelim- y tests were made in a commer- sodium hydride descaling bath. sequently, the study was extended a laboratory scale to cover the cts of time and temperature on rogen absorption in sodium hy- e, Virgo and acid pickling baths. bsequent to this work, the jet- engine and airframe industries had problems that were traceable to hydrogen contamination in titanium alloys.

The object of the present work was to demonstrate the magnitude of hydrogen contamination in titanium under various conditions. The sodium hydride bath is a 1.5 to 2 per cent solution of sodium hydride in molten sodium hydroxide. This bath is normally operated at 700-720°F. The Virgo bath has a sodium hydroxide base with some additives. The acid pickle investigated was 10 per cent nitric, 2 per cent hydrofluoric acid.

Significant hydrogen absorption in titanium can occur in a sodium hydride descaling bath and in a 10 per cent nitric, 2 per cent hydrofluoric acid pickle. The amount of hydrogen absorbed increased with increasing ratio of surface area to mass and also with time in the baths. There was a minimum at about 800°F in the hydrogen pickup from the sodium hydride descaling bath. No hydrogen pickup occurred with the Virgo bath, but this treatment resulted in surface pitting. The 8 per cent manganese



UNITED STATES PIPE & FOUNDRY CO.

Special Products Division

BURLINGTON, NEW JERSEY

SPECIAL PRODUCTS DIVISION USP

SALES OFFICES LOS ANGELES CHICAGO ST. LOUIS

-beta alloy (C-110M) absorbed hydrogen than the alpha com- ially pure (A-55) titanium.
ors: G. A. Lenning, C. M. head and R. I. Jaffee

tigation of Heat Treatability of Aluminum, 4% Vanadium Tita- Base Alloy—This alloy has a range of working temperatures. ng the working temperature en 1400 and 1750°F has little on mechanical properties re- g from any particular heat nent.
lex heat treatments give mod- y high strength levels accom- l by good ductilities. In ½-in. ns, tensile strengths from 130,- 175,000 psi and yield strengths 100,000 to 165.000 psi may be ued.
1550°F solution treatment re- in the lowest yield-tensile ratio ffers the possible advantages of machinability and excellent low rature formability.
alloy is stable under stress to and has excellent tensile prop- at this temperature. Its e endurance ratio is greater 0.55 for the heat treatments ted.
rs: R. G. Sherman and H. D. r

MOLYBDENUM

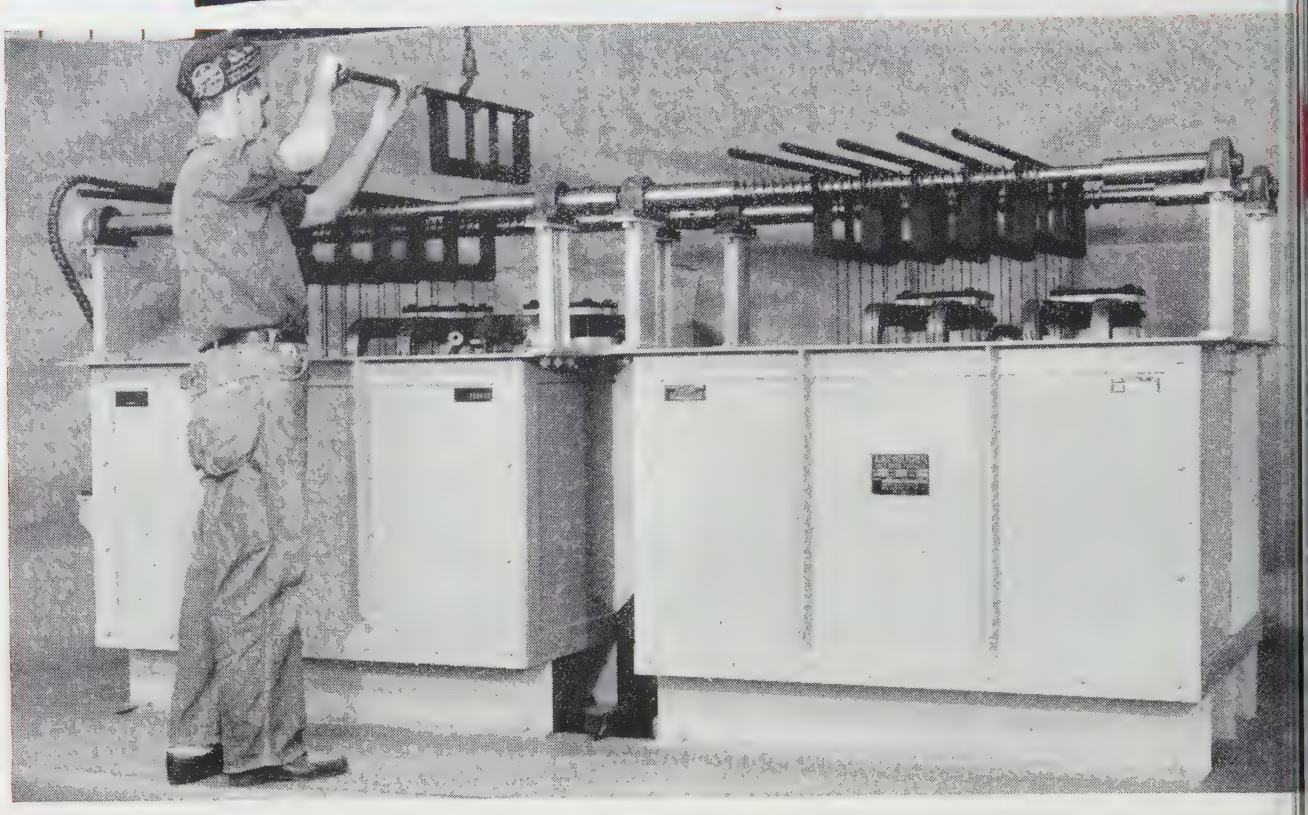
tion of Discontinuous Yielding uctile Molybdenum—The initia- f yielding under rapidly applied ant stress was investigated in ots of fine grained ductile mo- num. One lot was produced by c-casting method and the other wder metallurgy.
h lots were worked at temper- s below the recrystallization rature, followed by a recrystal- n treatment which produced er uniform fine grained struc- These materials exhibited dis- yield points in their static -strain relations.
results show that fine grained e molybdenum exhibits the menon of delayed yielding in a similar to that observed in an- low-carbon steels. This re- nds further support to the view yield point and delayed yield mena are a consequence of the ring of dislocations in body- ed cubic metals by interstitial s such as carbon and nitrogen. present work gives a tentative tion that nitrogen may be effective than carbon in anchoring dislocations or in strengthening grain boundaries in molybdenum.

A quantitative difference between the delayed yielding behavior of molybdenum and low-carbon steel is that the upper limiting stress in the stress vs. delay time relations may be observed at higher temperature in molybdenum than in steel.

Thus experimental studies of this upper limiting stress phenomenon with a view toward its possible relationship to convential transition temperatures might be more conveniently carried out with ductile molybdenum than with iron or steel.

The initial rate of pre-yield plastic strain in the sintered molybdenum tested at room temperature is found to depend upon the applied stress in a manner which is in agreement with a dislocation theory of delayed yielding. Quantitative comparison of theory and experiment in this respect yields a value for the binding energy of a dislocation in molybdenum with an atmosphere of interstitial solute atoms which is of the same order of magnitude as that found for iron.
Authors: J. A. Hendrickson, D. S. Wood and D. S. Clark

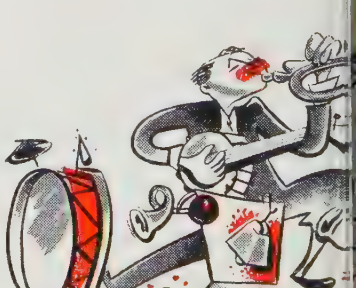
Let HOUGHTON help you improv



As every metal man knows, heat treatment of steel can be a very tricky and delicate operation. And it can be very expensive if your process suddenly takes a wrong turn somewhere or you're being forced to scrap a painful percentage of your production. For heat treating can no longer be classed as just a craft where skill is enough—it's become an exact science; and Houghton's Engineers and Metallurgists have learned this science from the ground up—inside and out.

Now here's how Houghton products and vast experience can help you get the uniform results you need at the low cost per ton of finished work you want:

Versatility



Houghton Liquid Salt Baths cover a wide temperature range from 350°F. to 2400°F. and are made for every phase of heat treating including drawing, martempering, annealing, quenching, carburizing, nitriding, normalizing and hardening of both ferrous and non-ferrous metals.

your heat treating results...

High Speed

Because thermal conductivity (heat transfer rate) from liquid salts to metal is much higher than is possible by heat radiation, liquid salts bring parts up to heat faster. Salt baths exclude *all* atmosphere from the metal, prevent scale formation and eliminate need for extra surface treatment.

Precision

can control the temperatures of liquid salts in two or three degrees throughout the entire and thus get positive, uniform results. And get the same results time after time because ghton Salt Baths are pure, stable, doubly ed and uniformly formulated for the treat- t prescribed.

OUGHTO-QUENCH ...The Final Step In Any Heat Treatment

With Houghto-Quench Oil you get the speed you need, maximum stability and complete "wet-out" in this all-important finale that makes the rest of the operation pay off. For uniform deep hardness, safety and dependability—specify Houghto-Quench.

You'd be surprised how many steelmen can whistle while they work since they switched to Houghton Heat Treating Products. Why not call in the Houghton Man to see how one or two or *all* of these products can improve your production and lower costs. Or write to E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.

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LININGS FOR TANK CARS AND TRAILER TANK

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RESISTANCE—Heresite linings effectively prevent product contamination of such items as Sulphuric Acid, Rubber Latex, Formaldehyde, Battery Acid, Lactic Acid, Acetic Acid, Fruit Juices and Wine. These products can be delivered fresh and full strength, unchanged

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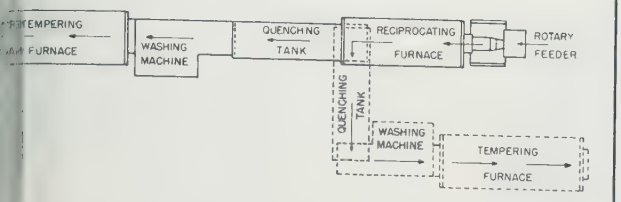
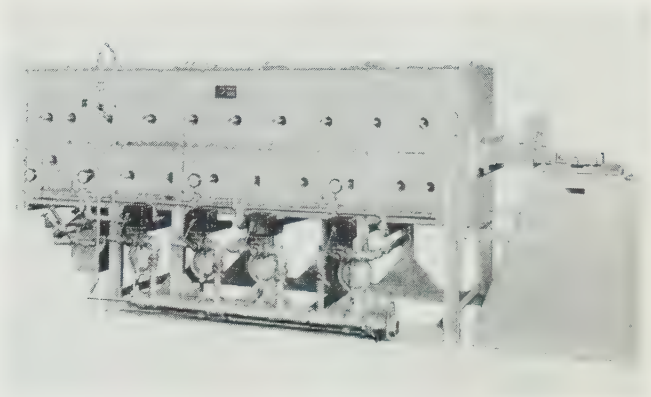
at Treating Installation Cuts Costs



d line shows an inline installation; dotted line shows eversing loop



s automatic, continuous unit consists of an au- c rotary feeder, a controlled atmosphere recip- g furnace and an automatic quenching tank. he Metal Show it will discharge work into an atic washing machine and an automatic tem- furnace of the neighboring exhibitor, Metal- Machinery Co., Elizabeth, N. J.

ut: 100 to 800 lb of controlled atmosphere reating, quenching, washing and tempering an A wide range of sizes cuts costs; the unit is for a small plant or can be fitted into a pro- n line in a large plant.

installation can be made either in line or in a ng loop as illustrated. The reversing loop dis- charges the work next to the charging end of the furnace and uses a minimum of floor space.

Each part is individually heat treated, quenched, washed and tempered as it passes through the reciprocating furnace. The disadvantages of batch processing are eliminated.

Flexibility permits handling small as well as large production lots on a continuous basis. Large production lots can be interrupted easily to run small batches of urgently needed work.

Work done includes clean hardening and light case carburizing. *Write*: American Gas Furnace Co., Elizabeth, N. J. *Phone*: Elizabeth 2-2120 (Metal Show Booth 1914)

ne-Cutting Machine Makes Any Shape

is an ideal production tool for any size shop. ers repetitive, accurate shape cutting with a torch. The machine also serves as an auxiliary supplement the output of larger, more expen- ape-cutting machines.

shape up to a 42-in. circle and straight lines 92 in. can be cut. A permanently magnetized ; roller accurately follows metal templates of st intricate shape.

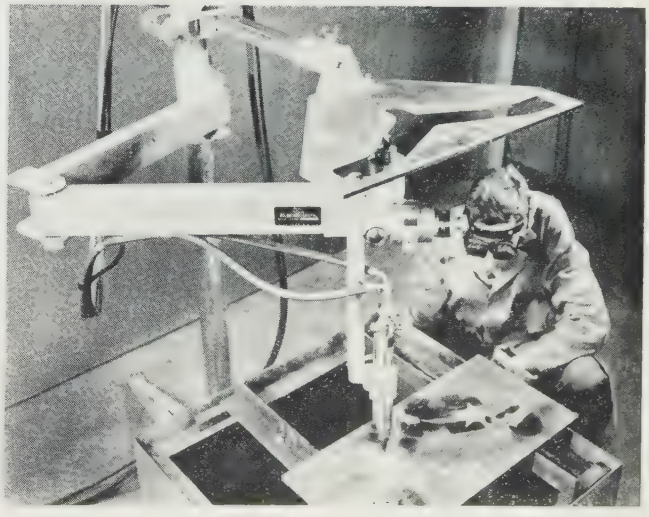
motor driveshaft of the camograph has a worm-gear drive; there are no couplings, pul- belts. The machine is portable.

ifier Arc Welder—This machine is designed for as-shielded, consumable-electrode welding. Volt- constant for all automatic applications using t-speed wire feed.

arc welder has a 3-phase transformer and a r bank. Coils are aluminum wound, silicone lass insulated for lightness and protection high temperatures and moisture.

ed draft cooling is provided by a fan with a ble ball-bearing motor. Reversing the motor ust and lint from the rectifier stack.

voltage may be preset from 15 to 44 arc volts.



Initial voltage may be set higher for ease in starting the arc. Once the arc is established the voltage automatically adjusts to the preset value. It remains constant regardless of the load conditions or changes in input line voltage.

Automatic Welding Head—This unit is designed for

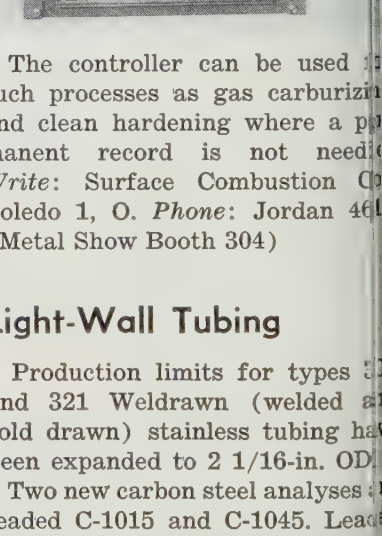
the automatic welding applicatio just described.

Argon, carbon dioxide and he um shielding gases and all kinds welding wires (0.30-in. diam a up) can be used.

The head has a single mot drive and a continuous current r ing of 600 amperes. *Write*: Air H duction Sales Co., 60 E. 42nd S New York 17, N. Y. *Phone*: Murr Hill 2-6700 (Metal Show Boo 1750)

Carbon Control

This automatic instrument controlled atmosphere heat tre ing has signal lights for high a low dew point indication. It co trols the carbon potential of a he treat furnace atmosphere.



The controller can be used such processes as gas carburizi and clean hardening where a p manent record is not need *Write*: Surface Combustion C Toledo 1, O. *Phone*: Jordan 46 (Metal Show Booth 304)

Light-Wall Tubing

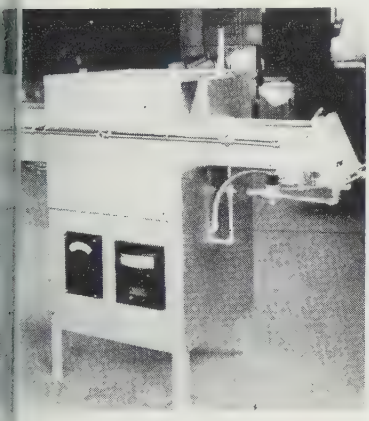
Production limits for types 3 and 321 Weldrawn (welded a cold drawn) stainless tubing ha been expanded to 2 1/16-in. OD

Two new carbon steel analyses leaded C-1015 and C-1045. Lead C-1015 has excellent machinabil It permits the use of tubing wh leaded carbon steel bar stock

pplied and complements the analysis. The C-1045 is a n carbon steel capable of a rdness level of 50-55 Rock- in the quenched and tem- condition. *Write*: Superior Co., Norristown, Pa. (Metal Booth 1470)

ring Furnace

rolled atmosphere sintering vdered metals (ferrous or rous), brazing, bright an- ; and many specialized appli- s in metallurgy and ceramics ets) are done by this furnace. ucts to be heat treated are on plates or trays and are through the successive ature zones by hand. Op- pusher systems have speeds as 0.03 ipm.



t losses are reduced to a min- by adjusting the radiation s to conform to the size or f product being treated. nterbalanced doors have au- c flame curtains. Operating rature is 2500°F or higher. imum power rating is 20 kw, single or 3 phase, 60 cycles. kva voltage regulating auto ormer is used. Large units ailable. *Write*: Pereny Equip- Co., 893 Chambers Rd., Co- s 12, O. *Phone*: Axminster

-Bed Lathe

s 11-in. machine has a 5-ft ts center to center distance n.

nique drive selector is con- l by a single lever which possible a choice between

loose and locked spindle, direct or gear drive.

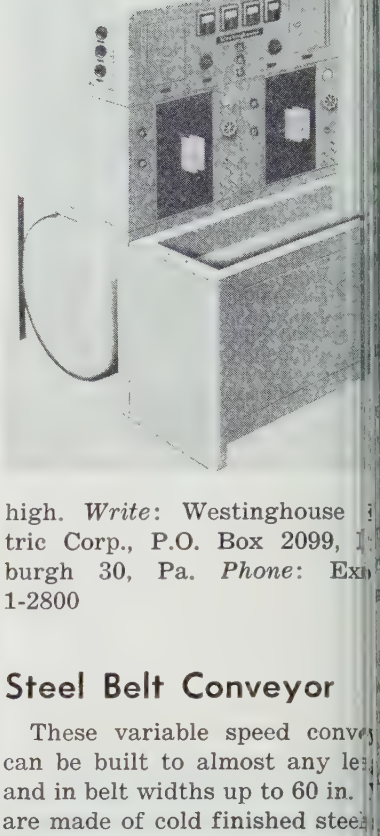
The variable-speed drive combines safety, convenience and infinite choice of speeds with the high-torque transmitting power of matched V-belts in the final drive. *Write*: Delta Power Tool Division, Rockwell Mfg. Co., 443 N. Lexington Ave., Pittsburgh 8, Pa. *Phone*: Churchill 1-8400 (Metal Show Booth 1530)

Induction Heating

This 30-kw "building block" unit can be combined and adapted to fit hardening and heat treating, metal-joining, hot-heading and forging operations.

The generator control cabinet contains the apparatus for control, instrumentation and protection of the high-frequency generator. A motor-generator set of 10,000 cycles is used.

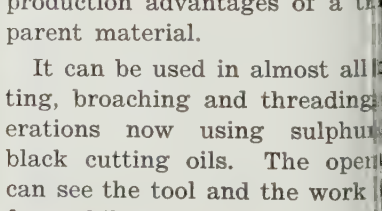
Dimensions of the unit are 48-in. wide, 59-in. deep and 77¾-in. high. *Write*: Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa. *Phone*: Exp 1-2800



Steel Belt Conveyor

These variable speed conve can be built to almost any le and in belt widths up to 60 in. are made of cold finished stee tions which are continu hinged with bolt pins.

Speeds range up to 100 fpm pacities to 300 psf.



The drive section usuall about 5 ft long and is equi with a high-torque, gear-in- motor. Self-aligning ball bea pillow blocks support the drive idler shaft. Adjustable spro take-ups maintain proper belt sion. *Write*: West Bend Equip Co., 343 Water St., West B Wis. *Phone*: Federal 4-5561

Oils and Lubricants

Cutting Oil—This new pro Texaco B HD, combines the saving benefits of heavy-duty sulphurized cutting oils with production advantages of a t parent material.

It can be used in almost all ting, broaching and threading erations now using sulphu black cutting oils. The ope can see the tool and the work face while using the new oil.

PRODUCTS and equipment

pressure properties give roduction between tool

ive Coolant—This soluble carries off heat effective- operating under severe nditions. It reduces proc- osts of a wide range of boring and broaching op-

il is easy to handle and for production runs. It ell with hard or soft tem- ater and makes a highly mulsion. Rust inhibiting s are excellent. any operations, it can re- cutting oil. It eliminates and helps prevent tool- .

ng Compound—Savings in l labor, increased die life iced unit costs are given o drawing compound 2. ew compound (it replaces the same name) incorpo- dispersion agent that re- e settling out of nonabra- ment. ompound allows dies to be or long periods without of the compound caking ening. Dies can be stored production run without of rusting. The material strongly to all surfaces ater miscible. ompound spreads easily on ch and blank surfaces, so metal being formed does e in contact with the form- aces. *Write*: The Texas Co., 2nd St., New York 17, N. Y. Murray Hill 9-7700 (Metal oth 734)

Thread Insert

is a new type insert that installed without cutting in the parent material. It's with plastics, laminates, d soft metals. It also can d in the die or mold of a extruded part with mold or to form strong, permanent, s steel threads when the made. *Write*: Heli-Coil Danbury, Conn. *Phone*: 3-3851 (Metal Show Booth

Quenching Oil

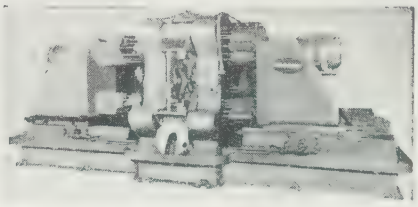
Fast cooling rates and high oxidation stability are given by this new oil. Its flash point is 380°F, its fire point, 425°F.

In many cases the new oil can quench low carbon or low alloy steels, where formerly water was necessary.

The oil has high water tolerance, low volatility and drains off hardened parts easily. *Write*: Shell Oil Co., 50 W. 50th St., New York 20, N. Y. *Phone*: Judson 6-5000

Indexing Machine

This special double-end trunnion machine processes 120 transmission plates an hour. It drills, chamfers and taps all mounting holes; it rough bores, finish bores and



chamfers the starter hole.

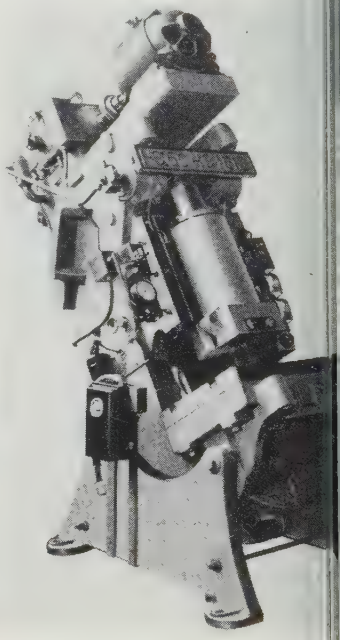
Long stroke units all heads to be retracted fr trunnion for quick change tools. Power cylinders au cally clamp the parts.

The machine has a centr ant system; all chips drop the center of the unit to veyor. *Write*: Michigan Dr Co., P. O. Box 4643, Det Mich. *Phone*: Jefferson 9-

Die Tryout Press

Here is a new hydrauli for die tryout and pilot tion runs. It combines t features of hydraulic acti gap frame construction.

Precise control over inchi mits close observation of tion. Full tonnage is avail any point in the stroke.

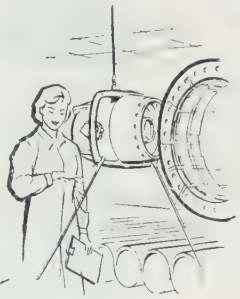


A long stroke compensa die space and press setup ments.

Models are available in ties from 50 to 250 tons. E. W. Bliss Co., Canton, O. 7-3421

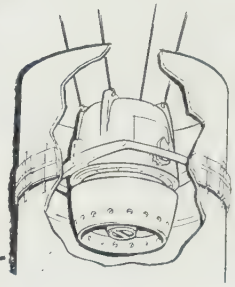
Chemical Neutralizer

Here is a product that en the appearance and salabi neutralized steel sheet. Pr a rust protective surface, th uct, Detrex CX, eliminates



SAFE

KEL-RAY projectors have extremely low radiation leakage. . . so low they can be shipped and stored without additional shielding. They are tamper, fire, and shock proof. Operated under prescribed procedures, leakage is below the AEC limit.



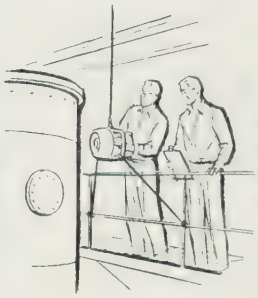
VERSATILE

A single set-up can produce either spot, doughnut, or hemisphere panoramic radiographs. Thick steel sections can be radiographed; sensitivity is so great even incandescent lamp filaments have been radiographed with a KEL-RAY projector.

for NON-DESTRUCTIVE INSPECTION and TESTING

CONVENIENT

Designed for field or shop use, the smallest model can be carried by hand—largest is transported and positioned speedily with standard equipment for materials handling and rigging.



ECONOMICAL

Initial and operating costs are low. No delicate parts to pamper or adjust . . . no expensive electrical power source required. Minimized overall set up and exposure time provide further savings.

The KEL-RAY line of gamma ray projectors is a development inspired by industry's need for truly safe, portable radiographic equipment. Now it is possible to do faster, more economical, non-destructive testing in field or factory.

Depending on the projector model and service requirements either encapsulated Cobalt 60, Cesium 137 or Iridium 192 is used as the gamma ray source. When the radioisotope is moved to the operating position, the projector emits an intense, sharply defined beam of gamma rays that pass through the solid subject to expose the film positioned behind.

Each of the three KEL-RAY Projector models is a portable, powerful, shielded, self-contained source of penetrating radiation for non-destructive inspection in maintenance, construction or quality control. There is a KEL-RAY Gamma Ray Projector that can improve your operations—save you time and money! Write for detailed literature.

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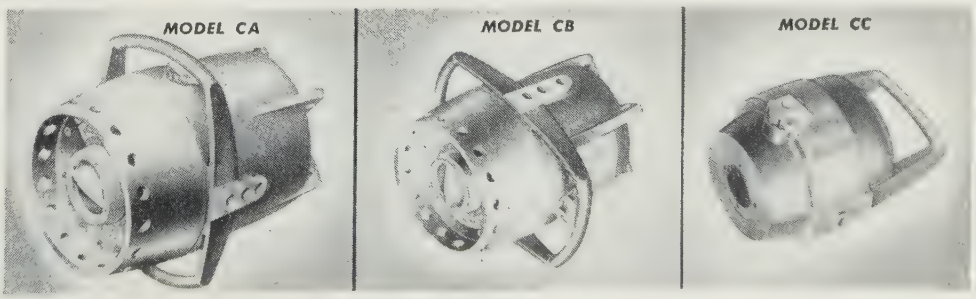
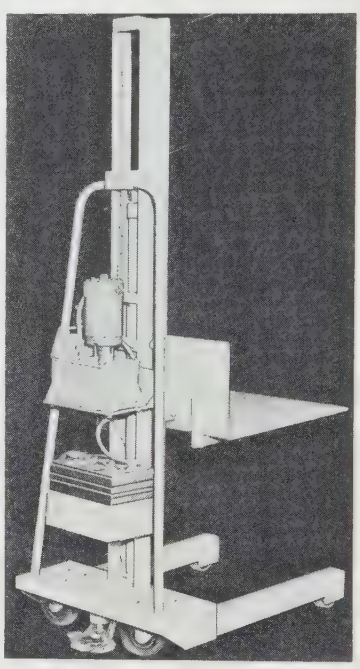


NEW PRODUCTS and equipment

of cyanides, lime and other alkaline neutralizers. *Write*: Detrex Corp., Box 501, Roosevelt Park Annex, Detroit 32, Mich. *Phone*: Townsend 8-8600 (Metal Show Booth 1205)

Hydraulic Stacker

This lightweight stacker handles up to 500 lb. A positive floor lock gives safety and stability.



The main frame is of welded construction. Wheels are mounted inside the main-frame channels for better clearance. Lifting height is 60 in.; lowered platform height is 5 in. The platform is 20 x 24 in. *Write*: Uhrden Inc., P.O. Box 51, Dennison, O.

Coil Straightener

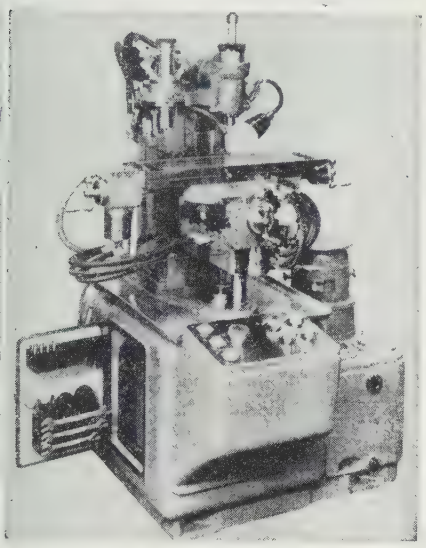
This combination cradle and straightener handles coils up to 36-in. wide, 60-in. in diameter,

weighing 20,000 lb. The rate of stock delivery is adjustable to speed requirements.

Rotating side plates prevent the crimping or damaging of stock ends. Stock up to 3/16-in. thick can be handled. *Write*: Special Engineering Service Inc., 8161 Livernois, Detroit 4, Mich. *Phone*: Texas 4-8700

Profile Milling Machine

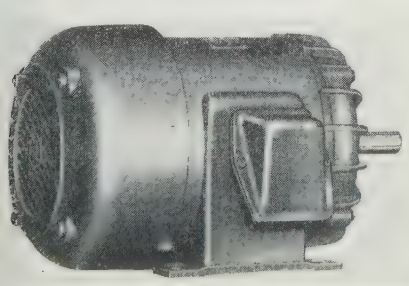
Fully automatic, this machine is used for three-dimensional copy milling of dies, rubber and glass molds, turbine blades and all workpieces of irregular shape. Highly skilled operators are not necessary.



Crossfeeds are variable from 0.005 to 0.250 in. Cutters up to ½-in. in diameter can be used. *Write*: Wickman Products Corp., 10325 Capital Ave., Oak Park, Detroit 37, Mich. *Phone*: Jordan 4-6389

Enclosed Motors

In production is a new line of rerated fan-cooled motors— 1 to 5 hp. The motor has an aluminum rotor. A ventilating fan provides efficient operation in either direction. All new NEMA require-

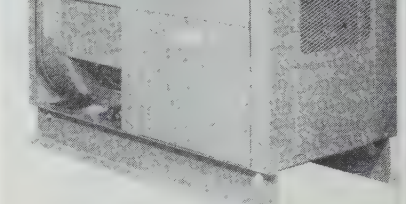


NEW PRODUCTS and equipment

ments are met. *Write*: Century Electric Co., 1806 Pine St., St Louis, Mo. *Phone*: Central 1-492

Welders

Here is a new line of gasoline engine-driven, generator-type welders available in current ranges of 30 to 350 amp, alternating or direct current.



All models have infinite current adjustment steps. They are compact, completely self-powered and may be equipped with optional running gear. *Write*: Westinghouse Electric Co., P. O. Box 2099 Pittsburgh 30, Pa. *Phone*: Express 1-2800

Welding Positioner

Here is a mechanical support for the automatic welding of cylindrical parts. Its capacity: 2500 lb.

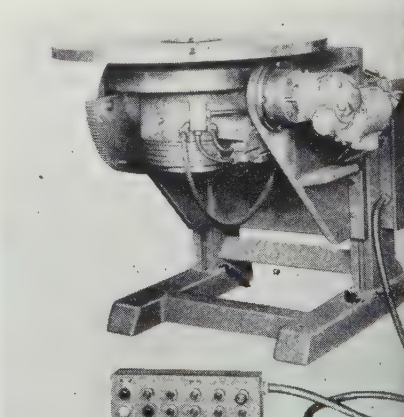


Table tilt is 135 degrees; rotation is 360 degrees. The hollow center table has a 9-in. ID and a

the
Van de Graaff®
Model JR offers

Wide-range Flexibility

for industrial radiography

Whether your inspection problems include

- high-quality production radiography of ½-inch to 5-inch steel sections
- aluminum, bronze, or stainless steel
- panoramic x-ray exposures of welded seams or groups of castings
- detection of hairline cracks or of microporosity

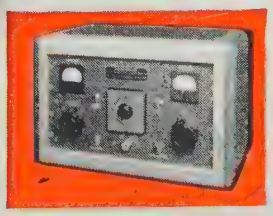
The model JR is the answer

- with its constant-potential one-million-volt radiation, by means of its 1-mm x-ray focal spot
- with sturdy design requiring no external cooling, no auxiliary apparatus
- well suited for complete transportability or cabinet type installation

Low cost — $25,000 for x-ray generator, complete controls, and supervision of installation (less mount).

Send for Bulletin JR

Visit us at the
National Metal Exposition
Philadelphia, Pennsylvania
October 17-21, 1955
Booth 625



The compact control system of the Model JR is portable and easy to operate.

The Model JR can be supplied in a battery operated lift-truck mounting for positioning within the x-ray area without an overhead crane.

Complete lift-truck-mounted model — $29,600.

HIGH VOLTAGE ENGINEERING CORPORATION

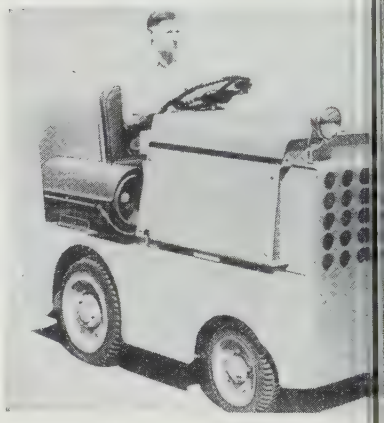
7 UNIVERSITY ROAD CAMBRIDGE 38, MASSACHUSETTS

NEW PRODUCTS and equipment

40-in. OD. Maximum table
is 2 rpm; minimum is 0.1
Write: Sciaky Bros. Inc., 49
67th St., Chicago, Ill. *Phone*:
mouth 7-5600

LP Gas Tractor

Extra long life and lower
tenance costs are the claim
this liquid petroleum gas tr
LP gas burns completely; it
no carbon, lead or varnish dep

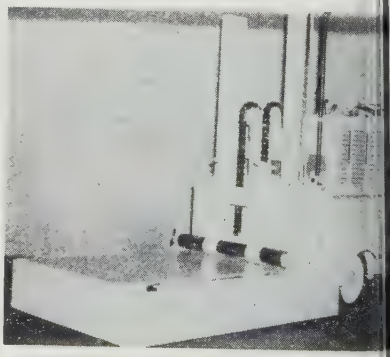


Increased engine compre
ratios give maximum power.
lite valves and inserts assure
life. *Write*: Mercury Mfg. Co.,
S. Halsted St., Chicago 9,
Phone: Yards 7-2515

Die Handling Truck

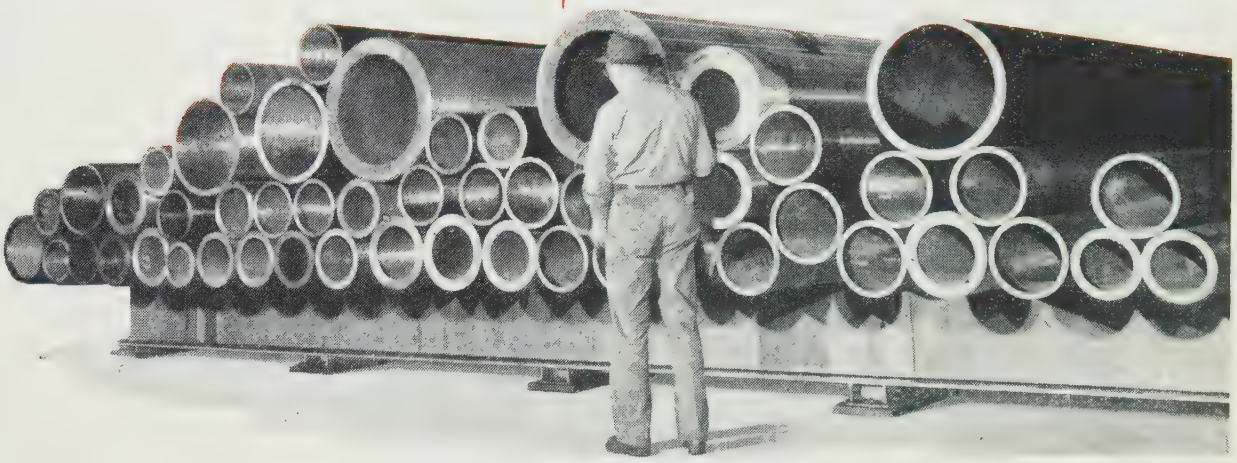
Capacity of this hydrauli
controlled truck is 16,000 lb.
152 in. long; its width is 60 in.
platform is 66 x 60 in.

Low position of the platfor
17½-in. from the floor, top he
is 74 in.



Three types of power units
available—battery, gas-electric
diesel-electric. *Write*: Elwell-Pa
er Electric Co., 4205 St. Clair A
Cleveland 3, O. *Phone*: Utah 1-6

B&W Offers
HOLLOW FORGINGS In A Wide Range of Sizes



B&W Hollow Forgings are produced in a large range of fractional inch sizes and a selected range of standard pipe sizes in accordance with the following ASTM Specifications: A 106-52T seamless carbon steel pipe for high-temperature service. A 266-54 carbon steel seamless drum forgings. A 312-54T seamless and welded austenitic stainless steel pipe. A 335-53T seamless ferritic alloy steel pipe for high-temperature service. A 376-54T seamless austenitic steel pipe for high-temperature central-station service.

Carbon Steel and Intermediate Alloys

Outside Diameter: 9¼ inches to 35¾ inches
Wall Thickness: ¾ inch to 5⅝ inches

STANDARD PIPE SIZES
AVAILABLE AS HOLLOW FORGINGS

Size Inches	Nom. OD Inches	Schedule Nos.
10	10¾	120–140–160
12	12¾	100–120–140–160
14	14	100–120–140–160
16	16	80–100–120–140–160
18	18	100–120–140–160
20	20	100–120–140–160
24	24	100–120–140–160

These pipe sizes are in complete agreement with ASA standard No. B36.10-1950.

Austenitic Stainless Steels

Outside Diameter: 9¼ inches to 33¾ inches
Wall Thickness: ½ inch to 4½ inches

MINIMUM WALL EQUIVALENTS OF
STANDARD PIPE SIZES AVAILABLE
AS STAINLESS STEEL HOLLOW FORGINGS

Size Inches	Nom. OD Inches	Schedule Nos.
10	10¾	80–100–120–140–160
12	12¾	60–80–100–120–140–160
14	14	60–80–100–120–140–160
16	16	60–80–100–120–140–160
18	18	80–100–120–140–160
20	20	100–120–140–160
24	24	100–120–140–160

For the complete range of B&W Hollow Forgings plus other important information on what B&W has to offer you in Hollow Forgings, send for Bulletin S-16B. The Babcock & Wilcox Company, Process Equipment Department, Barberton, Ohio.

BABCOCK & WILCOX

BOILER DIVISION

S-446

NEW Literatur

Write directly to the company for a c

Drive Selection

Tables and data make selection constant-speed, V-belt drives eas bulletin 20P40, 74 pages. Al Chalmers Mfg. Co., 1021 S. 70th Milwaukee, Wis.

Refractories

Performance data and specifi tions are presented for brick a special shapes—24 pages. Mull Refractories Co., Shelton, Conn.

Springs

Directions for specifying sprin are given—8 pages. Automa Spring Coiling Co., 4025 W. Tho dale Ave., Chicago 30, Ill.

Diamond Abrasive

Advantages of diamond abrasi for rough grinding and final poli ing are given—diamond series boo let 2, 8 pages. Abrasives Divisi Elgin National Watch Co., Elgin,

Gear Grinding

A complete line of new, fully au matic gear grinding machines is scribed—8 pages. Gear Grindi Machine Co., 3901 Christopher, I troit 11, Mich.

Titanium

Properties and methods of fab cating titanium are given—8 pag Pigments Dept., E. I. du Pont Nemours & Co. Inc., Wilmingt Del.

Hydraulic Presses

Here is information on double- tion presses in 50 to 300-ton cap ities—40 pages. Clifton Hydrau Press Co., 284-292 Allwood Rd., C ton, N. J.

Refractories

Here are tables on hydraulic-s ting refractories for service throu 3000°F—12 pages. Johns-Manvi 22 E. 40th St., New York 16, N.

Steel Shelving

Here is help in selection of she ing—catalog FF 188, 44 pages. Re ington Rand Division, Sperry Ra Corp., 315 Fourth Ave., New Yo 10, N. Y.

Solder for Aluminum

Bulletin tells how to use alloys a fluxes for soldering, brazing a

ng aluminum and its alloys. All-
Welding Alloys Co. Inc., 249-
erris Ave., White Plains, N. Y.

· Drills

tures of 21-in. sliding head
are illustrated—catalog D-140,
es. Installation and operation
overed—catalog D-141, 36 pages.
nati Lathe & Tool Co., Cincin-
, O.

-Drawn Tubing

ctricwelded tube, its applica-
and specifications are given—
es. Electricweld Tube Division,
& Laughlin Steel Corp., Pitts-
30, Pa.

Cutter

scribed is a tool that cuts holes
eel and brass. Erwood Inc.,
W. Berteau Ave., Chicago 13,

h Presses

istrations show uses of open
t presses—20 pages. Diamond
ine Tool Co., 5111 Coffman-Pico
Pico, Calif.

Handbook

icing, rated loads and ways to
slings are covered—64 pages.
n Wire Rope Corp., 2100 Man-
er Ave., Kansas City, Mo.

mation

ecial machine tools are illus-
l, and methods of selecting au-
ted machines are given — 24
s. Snyder Tool & Engineering
3400 E. Lafayette Ave., Detroit
ch.

Trucks

vantages of the automatic trans-
on for fork lift trucks are de-
ed. Towmotor Corp., 1226 E.
1 St., Cleveland 10, O.

n Handbook

re are data on boron carbide and
ental boron—16 pages. Norton
Worcester 6, Mass.

al Finishing

lder lists chemicals for metal fin-
g—24 pages. Enthone Inc., 442
St., New Haven 11, Conn.

erboard

lder gives uses of continuous
rboard sheet—12 pages. Dept. 11,
nal Container Corp., 7 Central
W., New York, N. Y.

ged Rings and Flanges

sign advantages and cost-cutting
cations of forgings in industrial

processing equipment and mac are given—bulletin 10,000, 12 Standard Steel Works Di Baldwin-Lima-Hamilton Corp., ham, Pa.

Heat Transfer

Diagrams and drawings show bustion and heat transfer equi in use—bulletin 108, 8 pages. mal Research & Engineering Conshohocken, Pa.

Screw Gage

Offered is a tool for gaging chine screws, wood screws and stock—Dayton Rogers Mfg. Co., 13th Ave. S., Minneapolis 7, Min

Seamless Welding Fittings

Alloy, carbon and stainless fit their types, grades and sizes are ered—bulletin FB-500, 6 pages. lar Products Division, Babcoc Wilcox Co., Beaver Falls, Pa.

Cranes

The use of cranes in automati described—bulletin M-30, 11 p Whiting Corp., Harvey, Ill.

Tool Catalog

Milling cutters and tool ho are covered—44 pages. Viking Co., P. O. Box 471, Shelton, Co

Cutter Catalog

Milling cutters, counterbores, mills and hobs are listed—cat 18-C, 48 pages. National Twist & Tool Co., Rochester, Mich.

Laboratory Equipment

Equipment for ore testing lab listed—catalog LG3-B10, 76 pa Denver Equipment Co., P. O. 5268, Denver 17, Colo.

Needle Rollers

Charts, formulas and illustrat cover precision needle rollers—c log 61, 12 pages. Kaydon Engin ing Corp., Muskegon, Mich.

Cold Forming

Machines for forming too parts are shown in action phot bulletin RF-55, 8 pages. Michi Tool Co., 7171 E. McNichols Rd., troit 12, Mich.

Cutting Fluids

Booklet tells how to handle ting fluids used in machining st less steel. Vanton Pump & E neering Corp., Division Cooper A Corp., 201 Sweetland Ave., Hills N. J.

Market Outlook

October 10, 1955

MIDWEEK as much steel will have been uced this year as in all of 1954. Last 's output was 88,311,652 net tons of steel ngots and castings.

is year's production appears to be headed a new record of between 115 million and million tons. The record, 111,609,719 tons, set in 1953. If production hits 116 million the industry will have operated at an age of 92 per cent of capacity this year. year's average was only 71 per cent.

H-UP—Heavy demand for steel and favor- conditions for production pushed steel in- output up 1 point in the week ended Oct. 9 7 per cent of capacity, highest rate since ast week of June.

OOK TO '56—Some of the business an- s looking ahead to 1956 have a feeling steel action then will approximate the 1955 out- with the tendency to be on the downside ere is any change.

eel buyers already are clamoring to get 956 order books. Although the government ome restrictions on credit to prevent a run- boom, many people think the reins will oosened enough to give business a thrust ard in time to influence next year's na- l elections. That would tend to keep steel action high.

NTORY MINDED—One support to steel action next year might be the building of tory. Users have been inclined this year ld to inventories, but they haven't accumu- much.

exception to this is the automobile indus- try. It has continued to take in steel during model change-overs, a period of low consumption. Automakers expect to chew up a lot of this steel in their early runs on 1956 models.

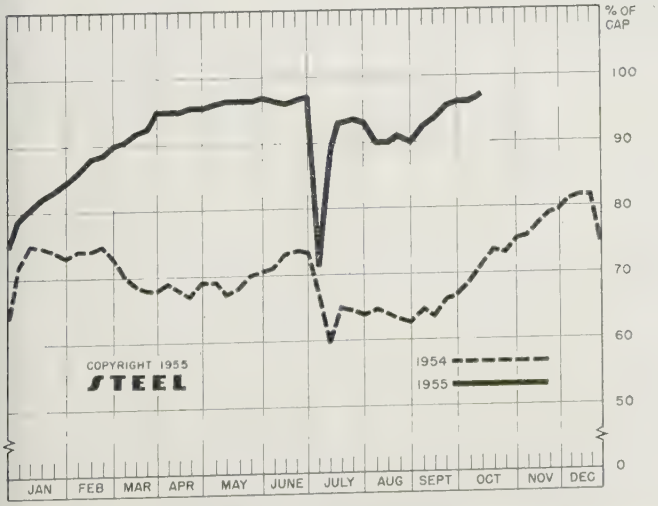
Appliance makers continue to press for steel. Household appliances are readily available in the stores, but they are being moved fast enough to keep the makers in the market for steel.

SLOWDOWN—Structurals have been a strong point in steel demand this year, but orders for fabricated material have eased. In August, orders for fabricated structural steel declined to 311,453 tons from the all-time record of 369,414 tons in the preceding month. Even so, August was the third highest month of this year. Historically, bookings decline in August. The present lag should not be prolonged, because a lot of work is being figured. Some fabricators say they can stand a little breather. Their delivery promises have become well extended, and there is a shortage of plain material.

SEEKING TO SAVE—The demand for steel is being abetted by the high price of copper. Superior Steel Corp., Carnegie, Pa., says there's a gradual increase in sales of its copper-clad strip as copper prices rise. Copper has risen around 65 per cent this year. This is prompting the use of copper-clad steel in place of solid copper.

Rise in tin plate prices on Oct. 1 pushed STEEL's price composite on finished steel to $128.14 a net ton, an increase of 73 cents. STEEL's price composite on steelmaking scrap advanced to $45.33 a gross ton.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of capacity engaged)

	Week Ended Oct. 9	Change	Same Week 1954	Same Week 1953
Pittsburgh	99.5	— 0.5*	74.5	97.5
Chicago	96.5	— 0.5*	72	97.5
Mid-Atlantic	94.5	+ 0.5	63	97
Youngstown	100	0	60	105
Wheeling	97.5	0	86.5	97
Cleveland	101	+ 1.5*	77.5	101
Buffalo	105	0	68	106.5
Birmingham	97.5	+ 2	74	96.5
New England	89	+ 1	52	80
Cincinnati	89.5	+ 2.5	66	84
St. Louis	88.5	0	75.5	103
Detroit	98	— 0.5	76	100
Western	99	0	87	102
National Rate..	97	+ 1	71	95

INGOT PRODUCTION‡

	Week Ended Oct. 9	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	145.0†	145.7	140.9	105.3
NET TONS (In thousands)	2,330	2,341	2,264	1,692

*Change from preceding week's revised rate. †Estimated. ‡Amer. Iron & Steel Institute. Weekly capacity (net tons): 2,413,278 in 1955; 2,384,549 in 1954; 2,254,459 in 1953.

ing Outlook—p. 93

Technical Outlook—p. 137

Price Indexes and Composites

FINISHED STEEL PRICE INDEX (Bureau of Labor Statistics)

	Oct. 4 1955	Sept. 27 1955	Month Ago	Sept. Average
(1947-1949=100)	154.5	153.9	153.9	153.9

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Oct. 4

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them write to STEEL.

Rails, Standard, No. 1	$4.800	Sheets, Electrical	$10.200
Rails, Light, 40 lb	6.217	Strip, C.R., Carbon	7.993
Tie Plates	5.625	Strip, C.R., Stainless, 430 (lb)	0.444
Axles, Railway	8.000	Strip, H.R., Carbon	5.350
Wheels, Freight Car, 33 in. (per wheel)	52.50	Pipe, Black, Buttweld (100 ft)	16.366
Plates, Carbon	4.950	Pipe, Galv., Buttweld (100 ft)	19.971
Structural Shapes	4.867	Pipe, Line (100 ft)	158.925
Bars, Tool Steel, Carbon (lb)	0.460	Casing, Oil Well, Carbon (100 ft)	165.120
Bars, Tool Steel Alloy, Oil Hardening Die (lb)	0.560	Casing, Oil Well, Alloy (100 ft)	244.670
Bars, Tool Steel, H.R., Alloy, High Speed W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.185	Tubes, Boiler (100 ft)	39.470
Bars, Tool Steels, H.R., Alloy, High Speed W 18, Cr 4, V 1 (lb)	1.680	Tubing, Mechanical, Carbon	20.980
Bars, H.R., Alloy	9.375	Tubing, Mechanical, Stainless, 304 (100 ft)	178.897
Bars, H.R., Stainless, 303 (lb)	0.450	Tin Plate, Hot-dipped, 1.25 lb	8.933
Bars, H.R., Carbon	5.350	Tin Plate, Electrolytic, 0.25 lb	7.633
Bars, Reinforcing	5.313	Black Plate, Canmaking Quality	6.733
Bars, C.F., Carbon	8.660	Wire, Drawn, Carbon	8.575
Bars, C.F., Alloy	12.175	Wire, Drawn, Stainless, 430 (lb)	0.578
Bars, C.F., Stainless, 302 (lb)	0.468	Bale Ties (bundle)	6.473
Sheets, H.R., Carbon	5.145	Nails, Wire, 8d Common	8.618
Sheets, C.R., Carbon	6.239	Wire, Barbed (80-rod spool)	7.847
Sheets, Galvanized	7.690	Woven Wire Fence (20-rod roll)	18.635
Sheets, C.R., Stainless, 302 (lb)	0.588		

STEEL's FINISHED STEEL PRICE INDEX*

	Oct. 5 1955	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Index (1935-39 av.=100)	208.97	207.63	207.63	194.53	157.28
Index in cents per lb	5.661	5.625	5.625	5.270	4.261

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT*	$128.14	$127.41	$127.41	$117.95	$94.50
No. 2 Fdry, Pig Iron, GT	58.99	58.99	58.99	56.54	48.79
Basic Pig Iron, GT	58.49	58.49	58.49	56.04	47.72
Malleable Pig Iron, GT	59.77	59.77	59.77	57.27	49.20
Steelmaking Scrap, GT	45.33	45.00	44.00	32.00	41.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts, in cents per pound exce[pt] wise noted. Delivered prices based on nearest productio[n]

FINISHED STEEL	Oct. 5 1955	Week Ago	Month Ago	Y[ear]
Bars, H.R., Pittsburgh	4.65	4.65	4.65	4[.]
Bars, H.R., Chicago	4.65	4.65	4.65	4[.]
Bars, H.R., deld. Philadelphia	4.90	4.90	4.90	4[.]
Bar, C.F., Pittsburgh	5.90	5.90	5.90	5[.]
Shapes Std., Pittsburgh	4.60	4.60	4.60	4[.]
Shapes, Std., Chicago	4.60	4.60	4.60	4[.]
Shapes, deld., Philadelphia	4.88	4.88	4.88	4[.]
Plates, Pittsburgh	4.50	4.50	4.50	4[.]
Plates, Chicago	4.50	4.50	4.50	4[.]
Plates, Coatesville, Pa.	4.50	4.50	4.50	4[.]
Plates, Sparrows Point, Md.	4.50	4.50	4.50	4[.]
Plates, Claymont, Del.	4.50	4.50	4.50	4[.]
Sheets, H.R., Pittsburgh	4.325	4.325	4.325	4[.]
Sheets, H.R., Chicago	4.325	4.325	4.325	4[.]
Sheets, C.R., Pittsburgh	5.325	5.325	5.325	4[.]
Sheets, C.R., Chicago	5.325	5.325	5.325	4[.]
Sheets, C.R., Detroit	5.325-5.425	5.325-5.425	5.325-5.425	5[.]
Sheets, Galv., Pittsburgh	5.85	5.85	5.85	5[.]
Strip, H.R., Pittsburgh	4.325	4.325	4.325	4[.]
Strip, H.R., Chicago	4.325	4.325	4.325	4[.]
Strip, C.R., Pittsburgh	6.25-6.45	6.25-6.45	6.25-6.45	5[.]
Strip, C.R., Chicago	6.35-6.45	6.35-6.45	6.35-6.45	6[.]
Strip, C.R., Detroit	6.35	6.35	6.35	5.60-5[.]
Wire, Basic, Pittsburgh	6.25	6.25	6.25	5[.]
Nails, Wire, Pittsburgh	7.60	7.60	7.60	6[.]
Tin plate (1.50 lb), box, Pitts.	$9.45	$9.05	$9.05	$9[.]

SEMIFINISHED STEEL				
Billets, Forging, Pitts. (NT)	$84.50	$84.50	$84.50	$78[.]
Wire rods, 3/8-5/8" Pitts.	5.025	5.025	5.025	4.6[.]

PIG IRON, Gross Ton				
Bessemer, Pitts.	$59.50	$59.50	$59.50	$57.[.]
Basic, Valley	58.50	58.50	58.50	56.[.]
Basic, deld. Phila.	59.16	59.16	59.16	59.[.]
No. 2 Fdry, Pitts.	59.00	59.00	59.00	56.[.]
No. 2 Fdry, Chicago	59.00	59.00	59.00	56.[.]
No. 2 Fdry, Valley	59.00	59.00	59.00	56.[.]
No. 2 Fdry, deld. Phila.	59.66	59.66	59.66	50.[.]
No. 2 Fdry, Birm.	55.00	55.00	55.00	52.[.]
No. 2 Fdry (Birm.) deld. Cin.	62.70	62.70	62.70	60.[.]
Malleable, Valley	59.00	59.00	59.00	56.[.]
Malleable, Chicago	59.00	59.00	59.00	56.[.]
Ferromanganese, Duquesne.	190.00†	190.00†	190.00†	190.[.]

†74-76% Mn, net ton. *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commissio[n])				
No. 1 Heavy Melt, Pitts.	$44.50	$43.50	$43.50	$32.5[.]
No. 1 Heavy Melt, E. Pa.	46.50	46.50	46.50	30.5[.]
No. 1 Heavy Melt, Chicago.	45.00	45.00	42.00	33.0[.]
No. 1 Heavy Melt, Valley.	48.00	46.50	46.50	35.0[.]
No. 1 Heavy Melt, Cleve.	44.50	44.00	44.00	32.0[.]
No. 1 Heavy Melt, Buffalo.	38.50	38.50	39.50	30.5[.]
Rails, Rerolling, Chicago	65.50	65.50	64.50	51.5[.]
No. 1 Cast, Chicago	48.50	48.50	46.50	39.5[.]

COKE, Net Ton				
Beehive, Furn, Connlsvl.	$13.625	$13.625	$13.625	$13.7[.]
Beehive, Fdry, Connlsvl.	16.50	16.50	16.50	16.7[.]
Oven, Fdry, Chicago	25.75	25.75	25.75	24.5[.]

Daily Nonferrous Price Record

	Price Oct. 5	Last Change	Previous Price	Sept. Avg.	Aug. Avg.	Oct. 1954 Avg.
Copper	43.00–50.00	Sept. 12, 1955	43.00	45.380	37.759	30.000
Lead	15.30	Sept. 26, 1955	14.80	14.920	14.800	14.775
Zinc	13.00	Sept. 6, 1955	12.50	12.940	12.500	11.500
Tin	96.25	Oct. 5, 1955	96.375	96.565	96.519	93.110
Nickel	64.50	Nov. 24, 1954	60.00	64.500	64.500	60.000
Aluminum	24.40	Aug. 8, 1955	23.20–24.40	24.400	24.267	22.200
Magnesium	32.50	Aug. 16, 1955	28.50	32.500	30.574	27.000

Quotations in cents per pound [fo]r COPPER, deld. Conn. Valley; [le]mon grade, deld. St. Lou[is] prime western, E. St. L[ou]is; Straits, deld. New York; NIC[KEL] trolytic cathodes, 99.9%, ba[sis] refinery, unpacked; ALUMINUM, ingots, 99 + %, deld.; M[AG] 99.8%, Freeport, Tex.

What You Can Use the Markets Section for:

- **A source of price information.**
  Current prices are reported each week. Price changes are shown in italics. Price trends are shown in tables of indexes and comparisons.
- **A directory of producing points.**
  Want to know who makes something, or where it is made? The steel price tables alphabetically list the cities of production and indicate the producing company. If you are a buyer, you may want to make a map showing comparative distances of sources of supply and to help you compute freight costs. If you are a seller of supplies you can make a map to spot your sales possibilities.
- **A source of price data for making your own comparis[ons]**
  Maybe you want to keep a continuous record of [the] spread between various forms of steel. You can get [the] base price information from STEEL's price tables.
- **A source of information on market trends.**
  Newsy items tell you about the supply-demand situ[ation] of materials, including iron and steel, nonferrous m[etals] and scrap. Other articles analyze special situations [of] terest and importance to you.
- **Reports on iron and steel production, and materials and [pro]uct shipments.**

For Precision use BISHOP

Platinum and Platinum Group Metals
Stainless Steel Tubing
Tubular Fabricated Parts
Spinnerettes
Hypodermic Needles and Syringes

Resistant to:
Corrosion
Heat
Shock
Stress
Vibration

STAINLESS STEEL Small Diameter Tubing
(.008" to 1.000" O.D.)

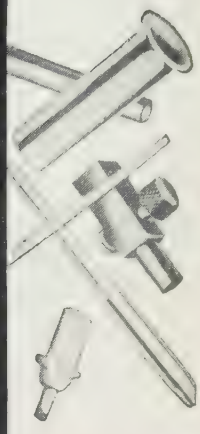
NICKEL* and NICKEL ALLOY* Tubing
(up to .625" O.D.)

AIRCRAFT TUBING

FABRICATED TUBULAR PARTS:
Bent
Flanged
Flared
Milled
Slotted
Swaged
Threaded

PLATINUM GROUP METALS AND ALLOYS:
Bimetals
Electrodes
Foil
Laboratory Apparatus
Precious Metal Catalysts
Rhodium Plating Solutions
Tubing
Wire

RESEARCH, ENGINEERING AND DEVELOPMENT SERVICES



METALS

J. BISHOP & CO. PLATINUM WORKS

Malvern, Pennsylvania
Serving Science and Industry Since 1842

Plants at Malvern, Pa., Fraser, Pa., Vineland, N. J. and Southern Pines, N. C.

* Trademark International Nickel Company

Nonferrous Metals

Protective coatings hold the key to converting molybdenum from a successful alloying agent to an even more promising base material for gas turbines, ramjets, etc.

Nonferrous Metal Prices, Pages 264 & 265

AFTER BEING a successful alloying material for 30 years, molybdenum is well on its way to becoming a base material, predicts Robert S. Archer, chief metallurgist for Climax Molybdenum Co., New York.

Arc-cast molybdenum, which allows the material to be produced in completely solid form, will be shown by Climax Molybdenum at the Metal Show next week in Philadelphia. Prior to the arc-casting process, all commercial metallic molybdenum was produced by compressing and sintering the powdered metal.

The largest furnace at Climax has produced 1000-lb molybdenum ingots 9 in. in diameter. By adding some electrical power and making minor equipment changes, these furnaces could produce ingots weighing up to a ton. "There is no reason," say company officials, "why the present furnace design could not be revamped so that ingots in the future could be 5 ft long and have 18-in. diameters."

Statistics — Molybdenum has a melting point of 4730° F (almost 2000° F higher than iron) and offers a useful strength which is greater than any other known material at operating temperatures over 1600° F. The drawback: Molybdenum oxidizes rapidly at temperatures above 1000° F. This deficiency has held back many high temperature uses.

Climax feels that the solution rests in protective coatings—one has withstood repeated heating and cooling for some 500 cycles. Applied with a spray gun, the coating is a mixture of powder which contains 20 per cent aluminum and an 80 per cent alloy (some 56 per cent chromium and 41 per cent silicon). All parts are coated with aluminum oxide to prevent adherence. After heating, the coating can be ground without chipping.

Results—Arc-cast molybdenum is similar to powder molybdenum but is superior to it in at least two respects: 1. It does not spall and crack when thin sections are machined. 2. A better finish can be obtained.

Where will metallic molybdenum be used? Since the development of the steam turbine, engineers have been looking for materials which would allow increased operating temperatures. If metallic molybdenum is successful, it would open temperature fields well over the present 1650° F for jet engines.

Possible applications include gas turbines, ramjets, guided missiles, nuclear reactors and hot-work dies. Hot-work die applications provide a promising field, particularly in die-casting brass and other alloys which have relatively high melting points.

Various firms and research organizations are conducting at least two other phases of experimentation to help raise operating temperatures: 1. Improved cermets with better resistance to impact and thermal shock. 2. Vacuum melting processes to produce better nickel and cobalt-base materials.

STEEL's Metal Price Averages for Sept., 1955

(Cents per lb)

Electrolytic Copper, deld. Connecticut	45.380
Lead, St. Louis	14.920
Prime Western Zinc, E. St. Louis, Ill.	12.940
Straits Tin, New York	96.565
Primary Aluminum Ingots, deld.	24.400
Magnesium, Freeport, Tex.	32.500
Nickel, f.o.b. refinery	64.500

Magnesium Production Jumps

The Magnesium Association, New York, reports that wrought magnesium production may pass the 10,000-ton mark in 1955. This would wipe out the 1951 record of 9500 tons. August tonnage (871 tons) was up 20 per cent from the previous month and rose some 57 per cent over the August total for last year.

Primary ingot production rose 15 per cent over July totals and topped last year's August production by 1 per cent. This is the first time this year that a monthly figure has ceeded the totals for the correspo ing month in 1954. It now appe says the association, that ingot duction will "approximate some 000 ingot tons despite a poor sec quarter, when strikes cut into duction schedules."

Will GSA Buy Zinc, Lead?

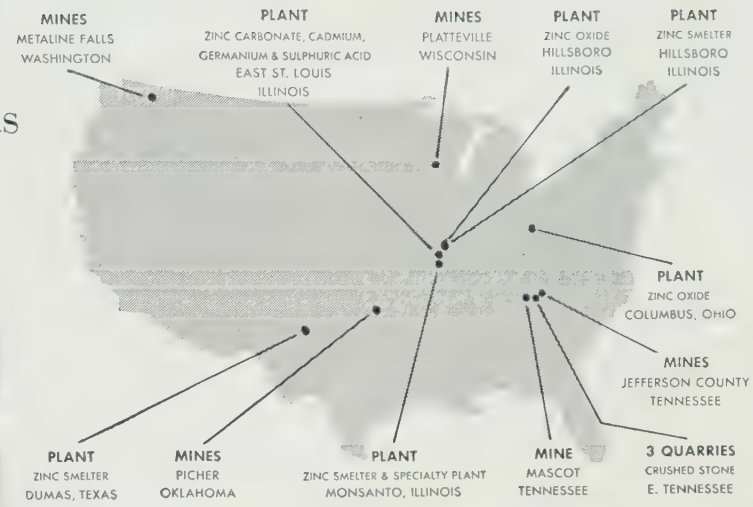
The General Services Administ tion has indicated that it will pay more than 28 cents a lb for combined price of lead and zinc. I to lead's recent increase (to 15 cents), the price structure for two metals is 28½-cents a pou The outlook: The government v offered only 1000 tons of lead stockpile in August. Previous dustry offers ran between 8000 10,000 tons. With the time for government's call still a week or t away, producers are far from cited. Civilian demand is high. the government wants these t metals for stockpile, it may have pay the price.

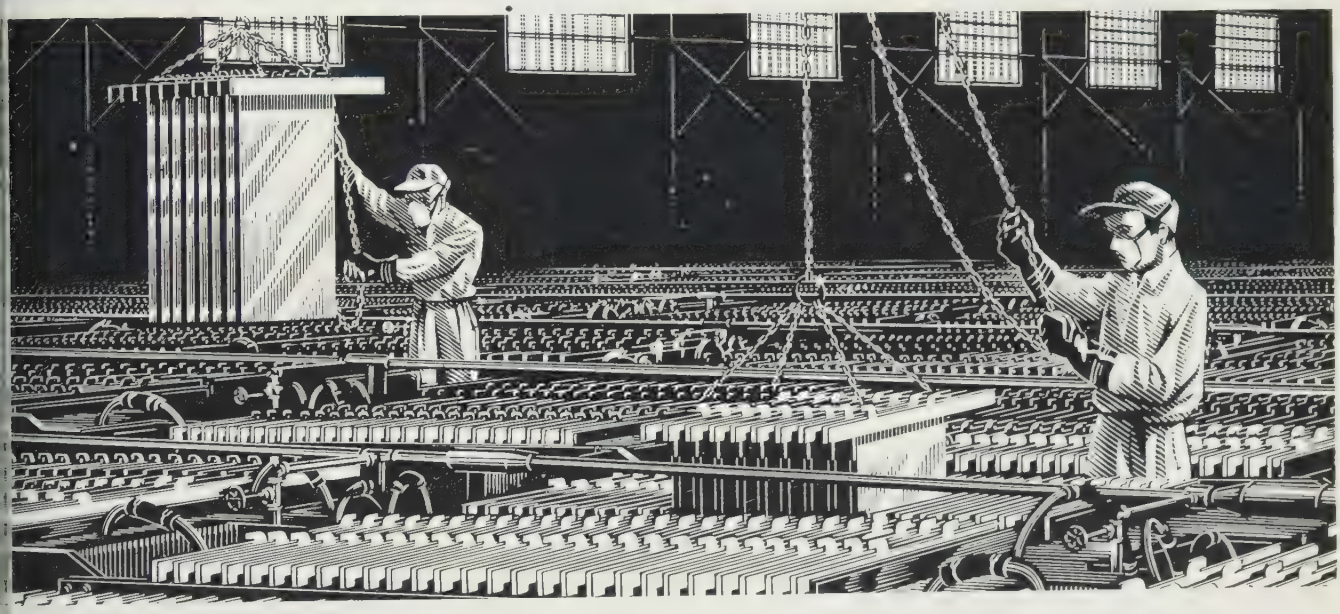
Coming: More Chilean Copper

Anaconda Co. will continue to pand its Chilean copper operatio After receiving Chile's highest awa for a foreigner (Order of Merit the Rank of Knight Commande Thomas A. Campbell, executive v president of Anaconda's Chile E ploration Co., announced that long dormant Africana Mine of Santiago Mining Co. will be ope and that a reduction plant will constructed for the beneficiation its ores.

Mr. Campbell reports that A conda will invest some $38 mill in the Chuquicamata mine to crease its yield by about 100 m lion lb per year. Part of the o lay will go into a new hospital, m housing and other welfare impro ments. The refining installations Potrerillos, producing 75 million of copper in blister form, will ref and cast the copper into electroly shapes. "And," says Mr. Campb "our prospective new mine at In Muerto should eventually add a c siderable share to the growing o put of Chilean copper. We fores Chile in the not too distant future suming its rightful place as the le ing copper producing country of t world."

American Zinc and its products *from* A *to* Z





OPERATIONS AT
MONSANTO, ILLINOIS

Modern and recently expanded electrolytic plant producing special high grade slab zinc, which is sold primarily to the die casting and brass manufacturing industries. In conjunction is a specialty plant for the production of zinc ball anodes, heavy plating anodes and anodes for cathodic protection. For complete picture of American Zinc operations, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

Distributors for

American Zinc sales Company

AMERICAN ZINC, LEAD & SMELTING COMPANY

Columbus, Ohio • Chicago • St. Louis • New York • Detroit • Pittsburgh

Nonferrous Metals

Cents per pound, carlots, except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99 + %, ingots 24.40, pigs 22.50. 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 12% Si, 26.2; No. 43, 5% Si, 26.00; No. 142, 4% Cu, 1.5% Mg, 2% Ni, 28.20; No. 195, 4.5% Cu, 0.8% Si, 27.60; No. 214, 3.8% Mg, 27.80, No. 356, 7% Si, 0.3% Mg, 26.20.

Antimony: R.M.M. brand, 99.5%, 33.00. Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.50-28.50, New York, duty paid, 10,000 lb or more.

Beryllium: 97%, lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $72.75 per lb of contained Be, f.o.b. Reading, Pa., Elmore, O.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. Reading, Pa., or Elmore, O.

Bismuth: $2.25 per lb, ton lots.

Cadmium: Sticks and bars, $1.70 per lb, deld.

Cobalt: 97-99%, $2.60 per lb for 550-lb keg; $2.62 per lb for 100-lb case; $2.67 per lb under 100 lb.

Columbium: Powder, $119.20 per lb, nom.

Copper: Electrolytic, 43.00 deld. Conn. Valley; 43.00 deld. Midwest; custom smelters, 50.00 deld.; Lake, 43.00 deld.; Fire refined, 42.75 deld.

Germanium: 99.9% $295 per lb, nom.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $90-$110 nom, per troy oz.

Lead: Common, 15.30, chemical, 15.40, corroding, 15.40, St. Louis. New York basis, add 0.20.

Lithium: 99%+, cups or ingot, $11.50; rod, $13.50; shot or wire, $14.50, f.o.b. Minneapolis, 100 lb lots.

Magnesium: 99.8%, self-palletizing pig, 32.50; notched ingot, 33.25, 10,000 lb or more, f.o.b. Freeport, Tex. For Port Newark, N. J., add 1.40 for pig and 1.45 for ingot; for Madison, Ill., add 1.20 for pig and 1.25 for ingot; for Los Angeles, add 2.00 for both pig and ingot. Sticks 1.3 in. diameter, 53.00, 100 to 4999 lb, f.o.b. Madison, Ill.

Magnesium Alloys: AZ91C and alloys C, G, H and R, 36.00; alloy M, 38.00, 10,000 lb or more, f.o.b. Freeport, Tex. For Port Newark, N. J., add 1.40; for Madison, Ill., add 0.50; for Los Angeles, add 2.50.

Mercury: Open market, spot, New York, $272-$278 per 76-lb flask.

Molybdenum: Powder 99% hydrogen reduced, $3-$3.25 per lb; pressed ingot, $4.06 per lb; sintered ingot, $5.53 per lb.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 64.50; 10-lb pigs, unpacked, 67.65; "XX" nickel shot, 69.00; "F" nickel shot or ingots for addition to cast iron, 64.50; prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 0.92.

Osmium: $80-$100, nom., per troy oz.

Palladium: $22-$24 per troy oz.

Platinum: $91-$96 per troy oz from refineries

Radium: $16-$21.50 per mg radium content depending on quantity.

Rhodium: $118-$125 per troy oz.

Ruthenium: $45-$55 per troy oz.

Selenium: 99.5%, $9-$10 per lb.

Silver: Open market, 91.875 per troy oz.

Sodium: 16.50, c.l.; 17.00, l.c.l.

Tantalum: Sheet, rod, $68.70 per lb; powder $56.63 per lb.

Tellurium: $1.75 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N. Y., spot 96.25; prompt, 96.125.

Titanium: Sponge, 99.3+%, grade A-1 ductile (0.3% Fe max), $3.95. grade A-2 (0.5% Fe max), $3.50 per pound.

Tungsten: Powder, 98.8%, carbon, reduced, 1000-lb lots, $4.50 per lb, nom., f.o.b. shipping point; less than 1000 lb add 15.00; 99+% hydrogen reduced, $4.65. Treated ingots, $6.70.

Zinc: Prime Western, 13.00; brass special, 13.25; intermediate, 13.50, E. St. Louis, freight allowed over 0.50 per pound. High grade, 14.35; special high grade, 14.50, deld. Diecasting alloy ingot No. 3, 17.25; No. 2, 18.25; No 5, 17.75, deld.

Zirconium: Ingots, commercial grade, 14.40 per lb; low-hafnium reactor grade, $23.07. Sponge, $10 per lb. Powder electronics grade, $15 per lb; flash grade, $11.50.

(Note: Chromium, manganese and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 31.00-33.00: No. 12 foundry alloy (No. 2 grade), 31.25-31.50; 5% silicon alloy, 0.60 Cu max, 32.75-33.00; 13 alloy, 0.60 Cu max, 32.75-33.00; 195 alloy, 32.75-33.25; 108 alloy, 31.50-32.00. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 31.00-32.25; grade 2, 30.00-31.25; grade 3, 29.25-30.50; grade 4, 28.50-30.00.

Brass Ingot: Red brass No. 115, 42.50; tin bronze No. 225, 56.50; No. 245, 48.75; high-leaded tin bronze No. 305, 45.75; No. 1 yellow No. 405, 34.75; manganese bronze No. 421, 38.25.

Magnesium Alloy Ingot: AZ63A, 34.00; AZ91B, 34.00; AZ91C, 34.00; AZ92A, 34.00.

NONFERROUS MILL PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb, f.o.b. Temple, Pa.; nominal 1.9% Be alloy) Strip, $1.84; rod, bar, wire, $1.81.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 100,000-lb lots, 48.35; 30,000-lb lots 48.88; l.c.l., 48.98. Weatherproof, 100,000-lb lots, 46.03; 30,000-lb lots, 46.28; l.c.l., 46.78. Magnetic wire deld., 15,000 lb or more, 55.52; l.c.l., 56.27.

LEAD

(Prices to jobbers, f.o.b Buffalo, Cleveland, Pittsburgh) Sheets, full rolls, 140 sq ft or more, $21 per cwt; pipe, full coils, $21 per cwt; traps and bends, list prices plus 30%

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill) Sheets, $14.00-$14.50; sheared mill plate, $11.00; strip, $14.00-$14.50; wire, $10.00-$10.50; forging billets, $8.75; hot-rolled and forged bars, $8.75.

ZINC

(Prices per lb, c.l., f.o.b. mill) Sheets, 23.00; ribbon zinc in coils, 20.50; plates 19.50-22.25.

ZIRCONIUM

Plate, $22; H.R. strip, $19; C.R. strip. $29; forged or H.R. bars, $17; wire, 0.015 in., 1.00c per linear foot.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheet, C.R.	102	78	99
Strip, C.R.	102	87	125
Plate, H.R.	97	82	95
Rod, Shapes H.R.	87	69	93
Rod, Shapes C.R.	91	75	115
Seamless Tubes	122	108	153
Shot, Blocks	...	65	...

ALUMINUM

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
Drawn				
0.125	67.9	66.4	...	...
0.156-0.172	57.5	55.9	...	...
0.188	57.5	55.9	...	71.7
0.219-0.234	54.5	52.9	...	...
0.250-0.281	54.5	52.9	...	68.4
0.313	54.5	52.9	...	65.2
Cold-finished				
0.375-0.547	53.4	51.4	63.7	61.3
0.563-0.688	53.4	51.4	60.6	57.5
0.750-1.000	52.1	50.1	55.4	54.2
1.063	52.1	50.1	...	52.3
1.125-1.500	50.1	48.2	53.6	52.3
Rolled				
1.563	48.8	46.9	...	...
1.625-2.000	48.2	46.2	...	50.5
2.125-2.500	47.0	45.0	...	...
2.563-3.375	45.6	43.6	...	...

ALUMINUM

Sheets and Circles: 110 and 3003 mill f... (30,000 lb base; freight allowed)

Thickness Range Inches	Flat Sheet	Flat Sheet Circles*	Coiled Sheet	Co... Sh... Ci...
0.249-0.136	37.5	42.3	...	
0.135-0.096	38.0	43.2	...	
0.095-0.077	38.7	44.2	36.1	
0.076-0.061	39.3	45.1	36.3	
0.060-0.048	39.9	45.6	36.7	
0.047-0.038	40.4	46.5	37.2	
0.037-0.039	40.8	47.0	37.6	
0.029-0.024	41.4	47.5	37.9	
0.023-0.019	42.2	49.0	38.8	
0.018-0.017	43.0	...	39.4	
0.016-0.015	43.9	...	40.2	
0.014	44.9	...	41.2	
0.013-0.012	46.1	...	41.9	
0.011	47.1	...	43.1	
0.010-0.0095	48.4	...	44.3	
0.009-0.0085	49.7	...	45.8	
0.008-0.0075	51.3	...	47.0	
0.007	52.8	...	48.5	
0.006	54.4	...	49.9	

*48 in. max diam. †26 in. max diam.

ALUMINUM

Plates and Circles: Thickness 0.250-3 ... 24-60 in. width or diam. 72-240 in. length...

Alloy	Plate Base	Circle B...
1100-F, 3003-F	36.5	40....
5050-F	37.6	41....
3004-F	38.6	43....
5052-F	39.9	45....
6061-T6	41.1	46....
2024-T4*	43.6	49....
7075-T6*	51.4	58....

*24-48 in. widths or diam, 72-180 in. lengt...

ALUMINUM

Forging Stock: Round, Class 1, 39.10-50... in specific lengths 36-144 in., diameters 0.... 8 in. Rectangles and squares, Class 1, 43... 56.20 in random lengths, 0.375-4 in. th... widths 0.750-10 in.

Pipe: A.S.A. Schedule 40, alloy 6063-T6, 24... lengths, plain ends, 90,000-lb base, per 100...

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
¾	$16.85	2	$ 51.8...
1	26.50	4	142.0...
1¼	35.85	6	256.7...
1½	42.90	8	386.3...

MAGNESIUM

Sheet: AZ31, commercial grade, 0.032 ... 99c; 0.064 in., 78.00c; 0.125 in., 63.50c, 30,... lb and over, f.o.b. mill.

Plate: AZ31, 61.00c, 30,000 lb or more, 0.... in. and over, widths 24-60 in., lengths 72-... in.; tread plate, 64.00c, 30,000 lb or more, ... in. thick, widths 24-60 in., lengths 60-192 ... tooling plate, 66.00c, 30,000 lbs or more, .2... 3,000 in., widths 60-72 in., lengths 72-180 ...

Extrusions: AZ31 commercial grade, recta... gles, ¼ x 2 in., 64.70c; 1 x 4 in., 69.50c. R... 1 in., 61.50c; 2 in., 59.00c. Tubing, 1 in. ... x 0.065 in., 82.50c; Angles, 1 x 1 x ⅛-... 68.40c; 2 x 2 x ¼-in., 62.50c. Channels... in., 63.40c. I-beams, 5 in., 62.70c.

NONFERROUS SCRAP

DEALER'S BUYING PRICES

(Cents per pound, New York, in ton lots)

Aluminum: 1100 clippings, 19.50; old shee... 17.00-17.50; borings and turnings, 11.00-11.... crankcases, 17.00-17.50; industrial castin... 16.70-17.50.

Copper and Brass: No. 1 heavy copper a... wire, 39.50-40.00; No. 2 heavy copper a... wire, 37.50-39.00; light copper, 35.00-37.... No. 1 composition red brass, 29.50-31.00; N... 1 composition turnings, 28.50-30.00; yell...

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES ...		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tube	Clean Heavy	Rod Ends	Clean Turnin...
Copper	62.76b	60.36c	....	62.82	39.000	39.000	38.25...
Yellow Brass	52.27	42.41d	52.81	55.18	28.875	28.625	26.75...
Red Brass, 85%	58.09	58.03	58.63	60.90	34.250	34.000	33.50...
Low Brass, 80%	56.55	56.49	57.09	59.36	32.750	32.250	31.75...
Naval Brass	55.63	49.94	62.69	58.79	26.750	26.500	26.00...
Com. Bronze, 90%	60.18	60.12	60.72	62.74	35.750	35.500	35.00...
Nickel Silver, 10%	66.00	68.33g	68.33	....	32.500	32.250	16.25...
Phos. Bronze, A, 5%	80.99	81.49	81.49	82.67	39.250	39.000	38.00...
Silicon Bronze	66.54	65.73	66.58	68.68e	37.625	37.375	36.87...
Manganese Bronze	59.37	53.38	63.82	....	27.000	26.750	25.75...
Muntz Metal	53.74	49.55	....	....	27.000	26.750	26.25...

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20,000 lb. f.o.b. shippin... point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb. g. Leade...

ss turnings, 18.50-19.00; new brass clip-gs, 25.00-26.50; light brass, 18.50-19.00; vy yellow brass, 21.50-22.00; new brass ends, 23.50-25.00; auto radiators, un-eated, 23.50-24.50; cocks and faucets, 24.50-50; brass pipe, 24.50-27.00.

ad: Heavy, 12.00-12.50; battery plates, 6.50-0; linotype and stereotype, 14.00-14.75; elec-type, 12.00-12.75; mixed babbitt, 14.50.

gnesium: Clippings, 18.50-19.50; clean cast-s, 18.00-19.00; iron castings, not over 10% novable Fe, less full deduction for Fe, 16.00-00.

nel: Clippings, 54.50-60.00; old sheets, 00-50.00; turnings, 54.00; rods, 54.50-60.00.

kel: Sheets and clips, 90.00-125.00; rolled des, 90.00-125.00; turnings, 75.00-100.00; ends, 90.00-125.00.

c: Old zinc, 5.50-6.00; new die-cast scrap, 0-5.75; old die-cast scrap; 3.50-4.00.

REFINER'S BUYING PRICES
ents per pound, carlots, delivered refinery)

minum: 1100 clippings, 23.00-23.50; 3003 ppings, 23.00-23.25; 6151 clippings, 23.00-25; 5052 clippings, 23.00-23.25; 2014 clip-gs, 21.50-22.50; 2017 clippings, 21.50-22.50; 24 clippings, 21.50-22.50; mixed clippings, 50-23.00; old sheet, 19.00-20.00; old cast, 50-20.00; clean old cable (free of steel), 00; borings and turnings, 20.00-21.00.

ryllium Copper: Heavy scrap, 0.020-in. and avier, not less than 1.5% Be, 65.00; light ap, 60.00; turnings and borings, 43.00-55.00.

pper and Brass: No. 1 copper and wire, 00; No. 2 copper and wire, 41.50; light pper, 39.00; refinery brass (60% copper) dry copper content, 37.50.

INGOTMAKERS' BUYING PRICES
(Cents per pound, carlots, delivered)

pper and Brass: No. 1 copper and wire, 00; No. 2 copper and wire, 41.50; light pper 39.00; No. 1 composition borings, 34.00; . 1 composition solids, 34.50; heavy yellow ass solids, 24.00; yellow brass turnings, 50; radiators, 27.00.

PLATING MATERIAL
f.o.b. shipping point, freight allowed on antities)

ANODES
dmium: Special or patented shapes, $1.70 r lb.

pper: Flat-rolled, 59.42, oval, 58.92, 00-10,000 lb; electrodeposited, 56.78, 2000-00 lb lots; cast 62.54, 5000-10,00 lb quanti-s.

ckel: Depolarized, less than 100 lb, $1.015; 0-499 lb, 99.50; 500-4999 lb, 95.50; 5000-,999 lb, 93.50; 30,000 lb, 91.50. Carbonized, duct 3 cents a lb. All prices eastern delivery fective Jan. 1, 1955.

n: Bar or slab, less than 200 lb, $1.145; 0-499 lb. $1.13; 500-999 lb, $1.125; 1000 or more, $1.12.

nc: Balls, 21.00; flat tops, 21.00; flats, .75; ovals, 22.00, ton lots.

CHEMICALS
dmium Oxide: $2.15 per lb, in 100-lb drums.

romic Acid: Less than 10,000 lb, 28.50; over 0,000 lb, 27.50.

pper Cyanide: 100-1000 lb, 80.00; 1000 lb d over, 78.00; effective Sept. 1, 1955.

pper Sulphate: Crystal, 100 lb, 21.50; 200 lb, .50; 300 lb, 17.50; 400 lb, 17.00; 500-1900 , 15.50; 2000-10,000 lb, 15.25; 10,000 lb and , 15.15. Powder, add 0.5 to above prices. Ef-ctive Mar. 29, 1955.

ickel Chloride: 100 lb, 46.50; 200 lb, 44.50; 0 lb, 43.50; 400-4900 lb, 41.50; 5000-9900 lb, .50; 10,000 lb and over, 38.50. All prices stern delivery, efective Jan. 1, 1955.

ickel Sulphate: 100 lb, 38.25; 200 lb, 36.25; 0 lb, 35.25; 400-4900 lb, 33.25; 5000-35,900 , 31.25; 36,000 lb, 30.25. All prices eastern elivery, effective Jan. 1, 1955.

ver Cyanide: (Cents per ounce) 4-oz bottle, .125; 16-oz bottle, 81.875; 80-oz bottle, .375; 100-oz bottle, 79.375; f.o.b. St. Louis, ew York and Los Angeles. Effective Apr. 6, 55.

dium Cyanide: Egg, under 1000 lb, 19.80; 000-19,900 lb, 18.80; 20,000 lb and over, 7.80; granular, add 1-cent premium to above.

dium Stannate: Less than 100 lb, 72.50; 0-600 lb. 58.10; 700-1900 lb, 55.70; 2000-900 lb, 53.90; 10,000 lb or more, 52.80.

tannous Chloride (Anhydrous): Less than 50 , $1.588; 50 lb, $1.248; 100-300 lb, $1.098; 0-900 lb, $1.074; 1000-1900 lb, $1.049; 2000-900 lb, $1.013; 5000-19,900 lb, 95.20; 20,000 or more, 89.10.

tannous Sulphate: Less than 50 lb, $1.287; 0 lb, 98.70; 100-1900 lb, 96.70; 2000 lb or ore, 94.70.

inc Cyanide: Under 1000 lb, 54.30; 1000 lb nd over, 52.30.

Steel Prices

Mill prices as reported to STEEL, cents per pound except as otherwise noted. *Changes shown in italics.*
Code numbers following mill points indicate producing company. Key on page 267. Key to footnotes, page 269

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall,Pa. U5 .....$65.50

INGOTS, Alloy (NT)

Detroit R7 .....$69.00
Houston S5 .....74.00
Midland,Pa. C18 .....69.00
Munhall,Pa. U5 .....69.00

BILLETS, BLOOMS & SLABS Carbon, Rerolling (NT)

Aliquippa,Pa. J5 ....$68.50
Bessemer,Pa. U5 .....68.50
Bridgeport,Conn. N19..73.50
Buffalo R2 .....68.50
Clairton,Pa. U5 .....68.50
Ensley,Ala. T2 .....68.50
Fairfield,Ala T2 .....68.50
Fontana,Calif. K1 ....76.00
Gary,Ind. U5 .....68.50
Johnstown,Pa. B2 ....68.50
Lackawanna,N.Y. B2 ..68.50
LoneStar,Tex. L6 ....74.50
Munhall, Pa. U5 .....68.50
Pittsburgh J5 .....68.50
S.Chicago,Ill. R2, U5..68.50
S.Duquesne,Pa. U5 ...68.50
Youngstown R2 .....68.50

Carbon, Forging (NT)

Aliquippa,Pa. J5 ....$84.50
Bessemer,Pa. U5 .....84.50
Bridgeport,Conn. N19..89.50
Buffalo R2 .....84.50
Canton,O. R2 .....86.50
Clairton,Pa. U5 .....84.50
Conshohocken,Pa. A3..89.50
Ensley,Ala. T2 .....84.50
Fairfield,Ala. T2 .....84.50
Fontana, Calif. K1 ....92.00
Gary,Ind. U5 .....84.50
Geneva,Utah C11 ....84.50
Houston S5 .....89.50
Johnstown,Pa. B2 ....84.50
Lackawanna,N.Y. B2..84.50
LosAngeles B3 .....94.00
Midland,Pa. C18 .....84.50
Munhall,Pa. U5 .....84.50
Pittsburgh J5 .....84.50
Seattle B3 .....98.00
S.Chicago R2,U5,W14..84.50
S.Duquesne,Pa. U5 ....84.50
S.SanFrancisco B3 ....94.00

Alloy, Forging (NT)

Bethlehem,Pa. B2 ...$96.00
Buffalo R2 .....96.00
Canton,O. R2, T7 ...96.00
Conshohocken,Pa. A3..103.00
Detroit R7 .....96.00
Fontana,Calif. K1 ....115.00
Gary,Ind. U5 .....96.00
Houston S5 .....101.00
Ind.Harbor,Ind. Y1 ...96.00
Johnstown,Pa. B2 ....96.00
Lackawanna,N.Y. B2 ..96.00
LosAngeles B3 .....116.00
Massillon,O. R2 .....96.00
Midland,Pa. C18 .....96.00
Munhall,Pa. U5 .....96.00
S.Chicago R2,U5,W14..96.00
S.Duquesne,Pa. U5 ...96.00
Struthers,O. Y1 .....96.00
Warren,O. C17 .....96.00

ROUNDS, SEAMLESS TUBE (NT)

Buffalo R2 .....$103.50
Canton,O. R2 .....103.50
Cleveland R2 .....103.50
Gary,Ind. U5 .....103.50
S.Chicago R2, W14 ...103.50
S.Duquesne,Pa. U5 ...103.50

SKELP

Aliquippa,Pa. J5 ....4.325
LoneStar,Tex. L6 ....4.625
Munhall,Pa. U5 .....4.225
SparrowsPoint,Md. B2..4.225
Warren,O. R2 .....4.225
Youngstown R2, U5 ...4.225

WIRE RODS

AlabamaCity,Ala. R2 ..5.025
Aliquippa,Pa. J5 .....5.025
Alton,Ill. L1 .....5.20
Buffalo B11, W12 ....5.025
Cleveland A7 .....5.025
Donora,Pa. A7 .....5.025
Fairfield,Ala. T2 .....5.025
Houston S5 .....5.275
IndianaHarbor,Ind. Y1.5.025
Johnstown,Pa. B2 ....5.025
Joliet,Ill. A7 .....5.025
KansasCity,Mo. S5 ....5.275
Kokomo,Ind. C16 ....5.125
LosAngeles B3 .....5.825
Minnequa,Colo. C10 ...5.275
Monessen,Pa. P7 .....5.025
N.Tonawanda,N.Y. B11.5.025
Pittsburg,Calif. C11 ...5.675
Portsmouth P12 .....5.025
Roebling,N.J. R5 ....5.125
S.Chicago,Ill. R2 .....5.025
SparrowsPoint,Md. B2..5.125
Sterling,Ill.(1) N15 ....5.025
Sterling,Ill. N15 .....5.125
Struthers,O. Y1 .....5.025
Worcester,Mass. A7 ...5.325

STRUCTURALS

Carbon Steel Std. Shapes

Ala.City,Ala. R2 .....4.60
Aliquippa,Pa. J5 .....4.60
Bessemer,Ala. T2 .....4.60
Bethlehem,Pa. B2 .....4.65
Birmingham C15 .....4.60
Clairton,Pa. U5 .....4.60
Fairfield,Ala. T2 .....4.60
Fontana,Calif. K1 ....5.25
Gary,Ind. U5 .....4.60
Geneva,Utah C11 .....4.60
Houston S5 .....4.70
Ind.Harbor,Ind. I-2 ....4.60
Johnstown,Pa. B2 ....4.65
KansasCity,Mo. S5 ....4.70
Lackawanna,N.Y. B2 ...4.65
LosAngeles B3 .....5.30
Minnequa,Colo. C10 ....4.90
Munhall,Pa. U5 .....4.60
Niles,Calif. P1 .....4.90
Portland,Oreg. O4 ....5.35
Phoenixville,Pa. P4 ....5.15
Seattle B3 .....5.35
S.Chicago U5, W14 ....4.60
S.SanFrancisco B3 ....5.25
Torrance,Calif. C11 ....5.30
Weirton,W.Va. W6 ....4.60

Wide Flange

Bethlehem,Pa. B2 .....4.65
Clairton,Pa. U5 .....4.60
Fontana,Calif. K1 ....5.40
Lackawanna,N.Y. B2 ...4.65
Munhall,Pa. U5 .....4.60
Phoenixville,Pa. P4 ....5.15
S.Chicago,Ill. U5 .....4.60

Alloy Std. Shapes

Clairton,Pa. U5 .....5.65
Fontana,Calif. K1 .....7.30
Gary,Ind. U5 .....5.65
Houston S5 .....5.75
Munhall,Pa. U5 .....5.65
S.Chicago,Ill. U5 .....5.65

H.S., L.A. Std. Shapes

Aliquippa,Pa. J5 .....6.75
Bessemer,Ala. T2 .....6.75
Bethlehem,Pa. B2 .....6.80
Clairton,Pa. U5 .....6.75
Fairfield,Ala. T2 .....6.75
Fontana,Calif. K1 ....7.40
Gary,Ind. U5 .....6.75
Geneva,Utah C11 .....6.75
Houston S5 .....6.85
Ind.Harbor,Ind. I-2, Y1.6.75
Johnstown,Pa. B2 ....6.80
KansasCity,Mo. S5 ....6.85
Lackawanna,N.Y. B2 ..6.80
LosAngeles B3 .....7.45
Munhall,Pa. U5 .....6.75
Seattle B3 .....7.50
S.Chicago,Ill. U5, W14..6.75
S.SanFrancisco B3 ....7.40
Struthers,O. Y1 .....6.75

H.S., L.A. Wide Flange

Bethlehem,Pa. B2 ....6.80
Lackawanna,N.Y. B2 ...6.80
Munhall,Pa. U5 .....6.75
S.Chicago,Ill. U5 .....6.75

PILING

BEARING PILES

Bethlehem,Pa. B2 .....4.65
Lackawanna,N.Y. B2 ...4.65
Munhall,Pa. U5 .....4.60
S.Chicago,Ill. U5 .....4.60

STEEL SHEET PILING

Ind.Harbor,Ind. I-2 ....5.45
Lackawanna,N.Y. B2 ...5.45
Munhall,Pa. U5 .....5.45
S.Chicago,Ill. U5 .....5.45

PLATES

PLATES, Carbon Steel

Ala.City,Ala. R2 .....4.50
Aliquippa,Pa. J5 .....4.50
Ashland,Ky.(15) A10 ...4.50
Bessemer,Ala. T2 .....4.50
Bridgeport,Conn. N19 ..4.75
Buffalo R2 .....4.50
Clairton,Pa. U5 .....4.50
Claymont,Del. C22 ....4.50
Cleveland J5, R2 .....4.60
Coatesville,Pa. L7 ....4.50
Conshohocken,Pa. A3 ..4.50
Detroit M1 .....4.60
Ecorse,Mich. G5 .....4.60
Fairfield,Ala. T2 .....4.50
Fontana,Calif.(30) K1 ..5.15
Gary,Ind. U5 .....4.50
Geneva,Utah C11 .....4.50
GraniteCity,Ill. G4 ....4.70
Harrisburg,Pa. C5 ....5.10
Houston S5 .....4.60
Ind.Harbor,Ind. I-2, Y1.4.50
Johnstown,Pa. B2 ....4.50
Lackawanna,N.Y. B2 ..4.50
LoneStar,Tex. L6 .....4.85
Mansfield,O. E6 .....4.50
Minnequa,Colo. C10 ....5.35
Munhall,Pa. U5 .....4.50
Newport,Ky. N9 .....4.50
Pittsburgh J5 .....4.50
Riverdale,Ill. A1 .....4.50
Seattle B3 .....5.40
Sharon,Pa. S3 .....4.50
S.Chicago R2, U5, W14.4.50
SparrowsPoint,Md. B2 ..4.50
Steubenville,O. W10 ....4.50
Warren,O. R2 .....4.50
Weirton,W.Va. W6 ....4.50
Youngstown R2, U5, Y1.4.50

PLATES, Carbon Abras. Resist.

Fontana,Calif. K1 .....6.30
Geneva,Utah C11 .....5.65
Johnstown,Pa. B2 .....5.65
SparrowsPoint,Md. B2 ..5.65

PLATES, Wrought Iron

Economy,Pa. B14 .....10.40

PLATES,High-Strength Low-Alloy

Aliquippa,Pa. J5 .....6.725
Bessemer,Ala. T2 .....6.725
Clairton,Pa. U5 .....6.725
Cleveland J5, R2 ....6.725
Coatesville,Pa. L7 ....6.725
Conshohocken,Pa. A3 ..6.725
Ecorse,Mich. G5 .....6.825
Fairfield,Ala. T2 .....6.725
Fontana,Calif.(30) K1 .7.375
Gary,Ind. U5 .....6.725
Geneva,Utah C11 .....6.725
Houston S5 .....6.825
Ind.Harbor,Ind. I-2, Y1.6.725
Johnstown,Pa. B2 ....6.725
LosAngeles B3 .....7.625
Munhall,Pa. U5 .....6.725
Pittsburgh J5 .....6.725
Seattle B3 .....7.625
Sharon,Pa. S3 .....6.725
S.Chicago,Ill. U5, W14.6.725
SparrowsPoint,Md. B2..6.725
Youngstown U5, Y1 ...6.725

PLATES, Alloy

Bridgeport,Conn. N19 ...6.55
Claymont,Del. C22 ....6.30
Coatesville,Pa. L7 ....6.30
Fontana,Calif. K1 .....6.95
Gary,Ind. U5 .....6.30
Houston S5 .....6.40
Ind.Harbor,Ind. Y1 ....6.30
Johnstown,Pa. B2 ....6.30
Munhall,Pa. U5 .....6.30
Newport,Ky. N9 .....6.30
Seattle B3 .....7.20
Sharon,Pa. S3 .....6.30
S.Chicago,Ill. U5, W14..6.30
SparrowsPoint,Md. B2 ..6.30
Youngstown Y1 .....6.30

FLOOR PLATES

Cleveland J5 .....5.575
Conshohocken,Pa. A3 ..5.575
Harrisburg,Pa. C5 ....5.575
Ind.Harbor,Ind. I-2 ...5.575
Munhall,Pa. U5 .....5.575
S.Chicago,Ill. U5 .....5.575

PLATES, Ingot Iron

Ashland c.l. (15) A10...4.75
Ashland l.c.l. (15) A10..5.25
Cleveland c.l. R2 .....5.10
Warren,O. c.l. R2 .....5.10

BARS

BARS, Hot-Rolled Carbon

Ala.City,Ala. R2 .....4.65
Aliquippa,Pa. J5 .....4.65
Alton,Ill. L1 .....4.85
Atlanta A11 .....4.85
Bessemer,Ala. T2 .....4.65
Birmingham C15 .....4.65
Bridgeport,Conn. N19 ..4.80
Buffalo R2 .....4.65
Canton,O. R2 .....4.75
Clairton,Pa. U5 .....4.65
Cleveland R2 .....4.65
Ecorse,Mich. G5 .....4.75
Emeryville,Calif. J7 ....5.40
Fairfield,Ala. T2 .....4.65
FairlessHills,Pa. U5 ...4.80
Fontana,Calif. K1 .....5.35
Gary,Ind. U5 .....4.65
Houston S5 .....4.90
Ind.Harbor,Ind. I-2, Y1.4.65
Johnstown,Pa. B2 .....4.65
Joliet,Ill. P22 .....4.65
KansasCity,Mo. S5 ....4.90
Lackawanna,N.Y. B2 ...4.65
LosAngeles B3 .....5.35
Massillon,O. R2 .....4.75
Midland,Pa. C18 .....4.65
Milton,Pa. M18 .....4.65
Minnequa,Colo. C10 ....5.10
Niles,Calif. P1 .....5.00
N.Tonawanda,N.Y. B11..4.65
Pittsburg,Calif. C11 ....5.35
Pittsburgh J5 .....4.65
Portland,Oreg. O4 .....5.40
Seattle B3, N14 .....5.40
S.Chicago R2, U5, W14..4.65
S.Duquesne,Pa. U5 ....4.65
S.SanFran.,Calif. B3 ...5.40
Sterling,Ill.(1) N15 ....4.65
Sterling,Ill. N15 .....4.75
Struthers,O. Y1 .....4.65
Torrance,Calif. C11 ....5.35
Warren,O. R2 .....4.65
Weirton,W.Va. W6 ....4.65
Youngstown R2, U5 ...4.65

BARS, H.R. Leaded Alloy

Warren,O. C17 .....6.325

BARS, Hot-Rolled Alloy

Bethlehem,Pa. B2 ....5.575
Bridgeport,Conn. N19 ..5.725
Buffalo R2 .....5.575
Canton,O. R2, T7 ....5.575
Clairton,Pa. U5 .....5.575
Detroit R7 .....5.575
Ecorse,Mich. G5 .....5.675
Fontana,Calif. K1 ....6.625
FairlessHills,Pa. U5 ...5.725
Gary,Ind. U5 .....5.575
Houston S5 .....5.825
Ind.Harbor,Ind. I-2,Y1.5.575
Johnstown,Pa. B2 ....5.575
KansasCity,Mo. S5 ...5.825
Lackawanna,N.Y. B2 ..5.575
LosAngeles B3 .....6.625
Massillon,O. R2 .....5.575
Midland,Pa. C18 .....5.575
S.Chicago R2, U5, W14.5.575
S.Duquesne,Pa. U5 ....5.575
Struthers,O. Y1 .....5.575
Warren,O. C17 .....5.575
Youngstown U5 .....5.575

BARS & SMALL SHAPES, H.R. High-Strength Low-Alloy

Aliquippa,Pa. J5 .....6.80
Bessemer,Ala. T2 .....6.80
Bethlehem,Pa. B2 .....6.80
Clairton,Pa. U5 .....6.80
Cleveland R2 .....6.80
Ecorse,Mich. G5 .....6.90
Fairfield,Ala. T2 .....6.80
Fontana,Calif. K1 .....7.50
Gary,Ind. U5 .....6.80
Houston S5 .....7.05
Ind.Harb.,Ind. I-2, Y1 ..6.80
Johnstown,Pa. B2 .....6.80
KansasCity,Mo. S5 ....7.05
Lackawanna,N.Y. B2 ..6.80
LosAngeles B3 .....7.50
Pittsburgh J5 .....6.80
Seattle B3 .....7.55
S.Chicago W14 .....6.80
S.Duquesne,Pa. U5 ....6.80
S.SanFrancisco B3 ....7.55
Struthers,O. Y1 .....6.80
Warren,O. R2 .....6.80
Youngstown U5 .....6.80

BAR SIZE ANGLES; H.R. Carbon

Bethlehem,Pa. B2 .....4.80

BAR SIZE ANGLES; S. Shapes

Aliquippa,Pa. J5 .....4.65
Atlanta A11 .....4.85
Fontana,Calif. K1 .....5.35
Niles,Calif. P1 .....5.00
Pittsburgh J5 .....
Portland,Oreg. O4 .....
SanFrancisco S7 .....

BAR SHAPES, Hot-Rolled

Clairton,Pa. U5 .....
Gary,Ind. U5 .....
Houston S5 .....
KansasCity,Mo. S5 ....
Youngstown U5 .....

BARS, C.F. Leaded Alloy

Ambridge,Pa. W18 ....
Camden,N.J. P13 .....
Chicago W18 .....
Cleveland C20 .....
Monaca, Pa. S17 .....
Newark,N.J. W18 .....
SpringCity,Pa. K3 .....
Warren,O. C17 .....

BARS, Cold-Finished Carbon

Ambridge,Pa. W18 .....
BeaverFalls,Pa. M12, R2
Buffalo B5 .....
Camden,N.J. P13 .....
Carnegie,Pa. C12 .....
Chicago W18 .....
Cleveland A7, C20 .....
Detroit R7 .....
Detroit B5, P17 .....
Donora,Pa. A7 .....
Elyria,O. W18 .....
FranklinPark,Ill. N5 ....
Gary,Ind. R2 .....
GreenBay,Wis. F7 .....
Hammond,Ind. L2, M13
Hartford,Conn. R2 .....
Harvey,Ill. B5 .....
LosAngeles R2, S30 .....
Mansfield,Mass. B5 .....
Massillon,O. R2, R8 .....
Midland,Pa. C18 .....
Monaca,Pa. S17 .....
Newark,N.J. W18 .....
NewCastle,Pa.(17) B4 ....
Pittsburgh J5 .....
Plymouth,Mich. P5 .....
Putnam,Conn. W18 .....
Readville,Mass. C14 .....
S.Chicago,Ill. W14 .....
SpringCity,Pa. K3 .....
Struthers,O. Y1 .....
Waukegan,Ill. A7 .....
Worcester,Mass. W19 ....
Youngstown F3, Y1 .....

BARS, Cold-Finished Carbon (Turned and Ground)

Cumberland,Md. C19 .....

BARS, Cold-Finished Alloy

Ambridge,Pa. W18 7
BeaverFalls,Pa.M12,R2 7
Bethlehem,Pa. B2 7
Buffalo B5 7
Camden,N.J. P13 .....
Canton,O. T7 7
Carnegie,Pa. C12 7
Chicago W18 7
Cleveland A7, C20 7
Detroit R7 7
Detroit B5, P17 7
Donora,Pa. A7 7
Elyria,O. W8 7
Gary,Ind. R2 7
GreenBay,Wis. F7 7
Hammond,Ind. L2, M13.7
Hartford,Conn. R2 7
Harvey,Ill. B5 7
Lackawanna,N.Y. B2 ..7
LosAngeles S30 .....
Mansfield,Mass. B5 ...7
Massillon,O. R2, R8 ...7
Midland,Pa. C18 7
Monaca,Pa. S17 7
Newark,N.J. W18 7
Plymouth,Mich. P5 7
S.Chicago W14 7
SpringCity,Pa. K3 7
Struthers,O. Y1 7
Warren,O. C17 7
Waukegan,Ill A7 7
Worcester,Mass. A7 ...7
Youngstown F3, Y1 ...7

BARS, Reinforcing (To Fabricators)

Ala.City,Ala R2 4
Atlanta A11 4
Birmingham C15 4
Buffalo R2 4
Cleveland R2 4
Ecorse,Mich. G5 4
Emeryville,Calif. J7 5
Fairfield,Ala. T2 4
FairlessHills,Pa. U5 4
Fontana,Calif. K1 5
Ft.Worth,Tex.(42) T4 ..5
Gary,Ind. U5 4
Houston S5 4

d,Harbor,Ind. I-2, Y1 4.65
hnstown,Pa. B2 ....4.65
liet,Ill. P22 ....4.65
ansasCity,Mo. S5 ....4.90
ckawanna,N.Y. B2 ..4.65
sAngeles B3 ....5.35
lton,Pa. M18 ....4.65
innequa,Colo. C10 ....5.10
les,Calif. P1 ....5.00
ttsburg,Calif. C11 ....5.35
ttsburgh J5 ....4.65
rtland,Oreg. O4 ....5.40
ndSprings,Okla. S5 ..5.15
attle B3, N14 ....5.40
Chicago R2 ....4.65
Duquesne,Pa. U5 ....4.65
SanFrancisco B3 ....5.40
arrowsPoint,Md. B2 ..4.65
erling,Ill.(1) N15 ....4.65
erling,Ill. N15 ....4.75
ruthers,O. Y1 ....4.65
rrance,Calif. C11 ....5.35
ungstown R2, U5, Y1 4.65

RS, Reinforcing (Fabricated; to Consumers)

hnstown,Pa. ¼-1" B2 6.15
nsasCity,Kans. S5 ...6.45
ckawanna,N.Y. B2 ..6.17
urion,O. P11 ....5.90
tsburgh U8 ....6.17
attle B3, N14 ....6.60
arrowsPt. ½-1" B2 ..6.15
lliamsport,Pa. S19 ..6.00

IL STEEL BARS

is,Pa.(3) J8 ....4.25
icagoHts.(3) C2, I-2..4.55
icagoHts.(4) C2, I-2..4.65
Worth,Tex.(26) T4 ..4.95
anklin,Pa.(3) F5 ....4.55
anklin,Pa.(4) F5 ....4.65
rion,O.(3) P11 ....4.50
line,Ill.(3) R2 ....4.65
awanda(3) B12 ....4.50
awanda(4) B12 ....4.65
lliamsport,Pa.(3) S19 4.65

ts, Wrought Iron

nomy,Pa.(S.R.)B14 11.50
nomy,Pa.(D.R.)B14 14.30
nomy(Staybolt)B14 14.65
K.Rks.(S.R.) L5 ...11.50
K.Rks.(D.R.) L5 ...16.00
K.Rks.(Staybolt) L5 17.00

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

Ala.City,Ala. R2 ....4.325
Allenport,Pa. P7 ....4.325
Ashland,Ky.(8) A10 ...4.325
Cleveland J5, R2 ....4.325
Conshohocken,Pa. A3 ..4.375
Detroit(8) M1 ....4.425
Dravosburg,Pa. U5 ....4.325
Ecorse,Mich. G5 ....4.425
Fairfield,Ala. T2 ....4.325
FairlessHills,Pa. U5 ...4.375
Fontana,Calif. K1 ....5.075
Gary,Ind. U5 ....4.325
Geneva,Utah C11 ....4.425
GraniteCity,Ill. G4 ....4.525
Ind.Harbor,Ind. I-2, Y1.4.325
Kokomo,Ind. C16 ....4.425
Lackawanna,N.Y. B2 ..4.325
Mansfield,O. E6, (37)..4.325
Munhall,Pa. U5 ....4.325
Newport,Ky.(8) N9 ...4.325
Niles,O. N12 ....4.325
Pittsburg,Calif. C11 ...5.025
Pittsburgh J5 ....4.325
Portsmouth,O. P12 ....4.325
Riverdale,Ill. A1 ....4.325
Sharon,Pa. S3 ....4.325
S.Chicago,Ill. W14 ....4.325
SparrowsPoint,Md. B2.4.325
Steubenville,O. W10 ...4.325
Warren,O. R2 ....4.325
Weirton,W.Va. W6 ....4.325
Youngstown U5, Y1 ..4.325

SHEETS, H.R. (19 Ga. & Lighter)

Ala.City,Ala. R2 ....5.625
Kokomo,Ind. C16 ....5.475
Niles,O. N12 ....5.325

SHEETS, H.R. Alloy

Ind.Harbor,Ind. Y1 ....7.20
Youngstown Y1 ....7.20

SHEETS, H.R. (14 Ga. & Heavier) High-Strength Low-Alloy

Cleveland J5, R2 ....6.375
Conshohocken,Pa. A3 ..6.425
Dravosburg,Pa. U5 ....6.375
Ecorse,Mich. G5 ....6.475
Fairfield,Ala. T2 ....6.375
FairlessHills,Pa. U5 ...6.425
Fontana,Calif. K1 ....7.125
Gary,Ind. U5 ....6.375
Ind.Harbor,Ind. I-2, Y1 6.375
Lackawanna(35) B2 ..6.375
Munhall,Pa. U5 ....6.375
Pittsburgh J5 ....6.375
Sharon,Pa. S3 ....6.375
S.Chicago,Ill. U5 ....6.375
SparrowsPoint(36) B2..6.375
Warren,O. R2 ....6.375
Weirton,W.Va. W6 ....6.375
Youngstown U5, Y1 ...6.375

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ...4.575
Cleveland R2 ....4.925
Ind.Harbor,Ind. I-2 ...4.575
Warren,O. R2 ....4.925

SHEETS, Cold-Rolled Steel (Commercial Quality)

Allenport,Pa. P7 ....5.325
Cleveland J5, R2 ....5.325
Conshohocken,Pa. A3 ..5.375
Dravosburg,Pa. U5 ....5.325
Detroit M1 ....5.325
Ecorse,Mich. G5 ....5.425
Fairfield,Ala. T2 ....5.325
FairlessHills,Pa. U5 ...5.375
Follansbee,W.Va. F4 ..5.325
Fontana,Calif. K1 ....6.425
Gary,Ind. U5 ....5.325
GraniteCity,Ill. G4 ....5.525
Ind.Harbor,Ind. I-2, Y1 5.325
Lackawanna,N.Y. B2 ..5.325
Mansfield,O. E6 ....5.325
Middletown,O. A10 ....5.325
Newport,Ky. N9 ....5.325
Pittsburg,Calif. C11 ..6.275
Pittsburgh J5 ....5.325
Portsmouth,O. P12 ....5.325
SparrowsPoint,Md. B2..5.325
Steubenville,O. W10 ...5.325
Warren,O. R2 ....5.325
Weirton,W.Va. W6 ....5.325
Youngstown Y1 ....5.325

SHEETS, Cold-Rolled High-Strength Low-Alloy

Cleveland J5, R2 ....7.875
Dravosburg,Pa. U5 ....7.875
Ecorse,Mich. G5 ....7.975
FairlessHills,Pa. U5 ...7.925
Fontana,Calif. K1 .. .8.975
Gary,Ind. U5 ....7.875
IndianaHarbor,Ind. Y1.7.875
Lackawanna(37) B2 ..7.875
Pittsburgh J5 ....7.875
SparrowsPoint(38) B2.7.875
Warren,O. R2 ....7.875
Weirton,W.Va. W6 ....7.875
Youngstown Y1 ....7.875

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 ....5.925
Middletown,O. A10 ....5.825
Warren,O. R2 ....5.925

SHEETS, Culvert (16 Gage)	Cu Alloy	Cu Fe
Ashland,Ky. A10	6.90	...
Canton,O. R2	6.10	6.55
Dravosburg U5	6.10	...
Fairfield T2	6.10	...
Gary,Ind. U5	6.10	6.35
Ind.Harbor I-2	6.10	6.35
Kokomo,Ind. C16	6.20	...
MartinsFry. W10	6.10	...
Newport,Ky. N9	6.10	6.35
Pitts.,Calif. C11	6.85	...
SparrowsPt. B2	6.10	...

SHEETS, Culvert—Pure Iron

Ashland,Ky. A10 ....7.15
Gary,Ind. U5 ....6.35
MartinsFry,O. W10 ....6.35

SHEETS, Galvanized Steel Hot-Dipped

Ala.City,Ala. R2 ....5.85‡
Ashland,Ky. A10 ....5.85†
Canton,O. R2 ....5.85‡
Delphos,O. N16 ....6.60‡
Dover,O. R1 ....5.85‡
Dravosburg,Pa. U5 ...5.85†
Fairfield,Ala. T2 ....5.85†
Gary,Ind. U5 ....5.85•
GraniteCity,Ill. G4 ....6.05
Ind.Harbor,Ind. I-2 ...5.85†
Kokomo,Ind. C16 ....5.95‡
MartinsFerry,O. W10 ..5.85•
Middletown,O. A10 ....5.85†
Newport,Ky. N9 ....5.85‡
Niles,O. N12 ....6.85‡
Pittsburg,Calif. C1 ....6.60*
SparrowsPt.,Md., B2 ..5.85†
Steubenville,O. W10 ...5.85‡
Warren,O. R2 ....5.85†
Weirton,W.Va. W6 ....5.85•

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1 ....6.575

SHEETS, Galvanized High-Strength Low-Alloy

Dravosburg,Pa. U5 ....8.60
SparrowsPoint(39) B2 ..8.60

SHEETS, Galvannealed Steel

Canton,O. R2 ....6.25
Dravosburg,Pa. U5 ....6.25
Kokomo,Ind. C16 ....6.60
Newport,Ky. N9 ....6.25
Niles,O. N12 ....7.25

SHEETS, Galvanized Ingot Iron (Hot-dipped Continuous)

Ashland,Ky. A10 ....6.10
Canton,O. R2 ....6.60
Middletown,O. A10 ....6.10

SHEETS. Electrogalvanized

Cleveland(28) R2 ....6.70
Niles,O.(28) R2 ....6.70
Weirton,W.Va. W6 ....6.55

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1).8.50
Butler,Pa. A10 (type 2).8.60

SHEETS, Enameling Iron

Ashland,Ky. A10 ....5.90
Cleveland R2 ....5.90
Dravosburg,Pa. U5 ....5.90
Gary,Ind. U5 ....5.90
GraniteCity,Ill. G4 ....6.10
Ind.Harbor,Ind. I-2 ....5.90
Middletown,O. A10 ....5.90
Niles,O. N12 ....5.90
Youngstown Y1 ....5.90

BLUED STOCK, 29 Gage

Follansbee,W.Va. F4 ...7.75
Ind.Harbor,Ind. I-2 ....7.75
Yorkville,O. W10 ....7.75

SHEETS, Long Terne Steel (Commercial Quality)

BeechBottom,W.Va. W10 6.25
Gary,Ind. U5 ....6.25
Mansfield,O. E6 ....6.25
Middletown,O. A10 ....6.25
Niles,O. N12 ....6.25
Weirton,W.Va. W6 ....6.25

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10 ....6.65

Key to Producers

Acme Steel Co.
Alan Wood Steel Co.
Allegheny Ludlum Steel
Alloy Metal Wire Co.
American Shim Steel Co.
American Steel & Wire
Anchor Drawn Steel Co.
Angell Nail & Chaplet
Armco Steel Corp.
Atlantic Steel Co.

Babcock & Wilcox Co.
Bethlehem Steel Co.
Beth. Pac. Coast Steel
Blair Strip Steel Co.
Bliss & Laughlin Inc.
Braeburn Alloy Steel
Brainard Steel Div., Sharon Steel Corp.
E. & G. Brooke, Wickwire Spencer Steel Div.
Colo. Fuel & Iron
Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
Buffalo Steel Corp.
A. M. Byers Co.
J. Bishop & Co.

Calstrip Steel Corp.
Calumet Steel Div.
Borg-Warner Corp.
Carpenter Steel Co.
Central Iron & Steel Div.
Barium Steel Corp.
Cleve. Cold Rolling Mills
Cold Metal Products Co.
Colonial Steel Co.
Colorado Fuel & Iron
Columbia-Geneva Steel
Columbia Steel & Shaft.
Columbia Tool Steel Co.
Compressed Steel Shaft.
Connors Steel Div.
H. K. Porter Co. Inc.
Continental Steel Corp.
Copperweld Steel Co.
Crucible Steel Co.
Cumberland Steel Co.

C20 Cuyahoga Steel & Wire
C22 Claymont Steel Products Dept. Wickwire Spencer Steel Division
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.
C31 Chester Blast Furnace Inc.

D2 Detroit Steel Corp.
D3 Detroit Tube & Steel
D4 Disston & Sons, Henry
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas&Fuel Assoc.
E2 Eastern Stainless Steel
E4 Electro Metallurgical Co.
E5 Elliott Bros. Steel Co.
E6 Empire Steel Corp.

F2 Firth Sterling Inc.
F3 Fitzsimons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div. Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G2 Globe Iron Co.
G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins, E., Steel Tube
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L5 Lockhart Iron & Steel
L6 Lone Star Steel Co.
L7 Lukens Steel Co.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M13 Monarch Steel Div., Jones & Laughlin Steel Corp.
M14 McInnes Steel Co.
M16 Md. Fine & Special. Wire
M17 Metal Forming Corp.
M18 Milton Steel Prod. Div., Merritt-Chapman&Scott

N1 National-Standard Co.
N2 National Supply Co.
N3 National Tube Div.
N5 Nelsen Steel & Wire Co.
N6 NewEng.HighCarb.Wire
N8 Newman-Crosby Steel
N9 Newport Steel Corp.
N12 Niles Rolling Mill Div.
N14 Northwest.SteelRoll.Mills
N15 Northwestern S.&W. Co.
N16 New Delphos Mfg. Co.
N19 Northeastern Steel Corp.

O3 Oliver Iron & Steel Corp.
O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Iron & Steel Co.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke & Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Division Detroit Steel Corp.
P13 Precision Drawn Steel
P14 Pitts. Screw & Bolt Co.
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., Amer. Chain & Cable
P17 Plymouth Steel Co.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.

R1 Reeves Steel & Mfg. Co.
R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R7 Rotary Electric Steel Co.
R8 RelianceDiv.,EatonMfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Steel Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Corp.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Products
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service

T2 Tenn. Coal & Iron Div.
T3 Tenn. Prod. & Chem.
T4 Texas Steel Co.
T5 Thomas Strip Division, Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div. Am. Rad. & Stan. San.
T13 Tube Methods Inc.

U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div.

V2 Vanadium-Alloys Steel
V3 Vulcan Crucible Division, H. K. Porter Co. Inc.

W1 Wallace Barnes Co.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W7 W. Va. Steel & Mfg. Co.
W8 West.Auto.Mach.Screw
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.
W19 Worcester Pressed Steel

Y1 Youngstown Sheet&Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2 ..4.325
Allenport,Pa. P7 .....4.325
Alton,Ill. L1 .....4.50
Ashland,Ky.(8) A10 ...4.325
Atlanta A11 .....4.525
Bessemer,Ala. T2 .....4.325
Birmingham C15 .....4.325
Bridgeport,Conn. N19 ..4.625
Buffalo(27) R2 .....4.325
Conshohocken,Pa. A3 ..4.375
Detroit M1 .....4.425
Ecorse,Mich. G5 ..... 4.425
Fairfield,Ala. T2 .....4.325
Fontana,Calif. K1 ....5.075
Gary,Ind. U5 .....4.325
Ind.Harbor,Ind. I-2, Y1.4.325
Johnstown,Pa.(25) B2..4.325
Lackaw'na,N.Y.(24) B2 4.325
LosAngeles(25) B3 ....5.075
Milton,Pa. M18 .....4.325
Minnequa,Colo. C10 ...5.425
NewBritain(10) S15 ...4.325
N.Tonawanda,N.Y. B11 4.325
Pittsburg,Calif. C11 ...5.075
Portsmouth,O. P12 ....4.325
Riverdale,Ill. A1 .....4.325
SanFrancisco S7 .....5.05
Seattle(25) B3 .....5.325
Seattle N14 .....5.40
Sharon,Pa. S3 .....4.325
S.Chicago,Ill. W14 ....4.325
S.SanFrancisco(25) B3.5.075
SparrowsPoint,Md. B2..4.325
Sterling(1) N15 .....4.325
Sterling,Ill. N15 .....4.425
Torrance,Calif. C11 ...5.075
Warren,O. R2 .....4.325
Weirton,W.Va. W6 ....4.325
Youngstown U5 .....4.325

STRIP, Hot-Rolled Alloy

Bridgeport,Conn. N19 ..7.50
Carnegie,Pa. S18 .....7.20
Fontana,Calif. K1 .....8.85
Gary,Ind. U5 .....7.20
Ind.Harbor,Ind. Y1 ....7.20
LosAngeles B3 .....8.40
Newport,Ky. N9 .....7.20
Sharon,Pa. S3 .....7.20
S.Chicago W14 .....7.20
Youngstown U5, Y1 ....7.20

STRIP, Hot-Rolled High-Strength Low-Alloy

Bessemer,Ala. T2 .....6.425
Conshohocken,Pa. A3 ..6.425
Ecorse,Mich. G5 .....6.525
Fairfield,Ala. T2 .....6.425
Fontana,Calif. K1 ....7.525
Gary,Ind. U5 .....6.425
Houston S5 .....6.675
Ind.Harbor,Ind. I-2, Y1.6.425
KansasCity,Mo. S5 ....6.675
Lackawanna,N.Y. B2 ..6.425
LosAngeles(25) B3 ....7.175
Seattle(25) B3 .....7.425
Sharon,Pa. S3 .....6.425
S.SanFrancisco(25) B3.7.175
SparrowsPoint,Md. B2..6.425
Warren,O. R2 .....6.425
Weirton,W.Va. W6 ....6.425
Youngstown U5, Y1 ....6.425

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10 ...4.575
Warren,O. R2 .....4.925

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6 .....6.25
Baltimore T6 .....6.25
Boston T6 .....6.80
Buffalo S40 .....6.25
Cleveland J5 .....6.45
Cleveland A7 .....6.25
Conshohocken,Pa. A3 ...6.30
Dearborn,Mich. D3 ....6.35
Detroit D2, M1, P20 ...6.35
Dover,O. G6 .....6.25
Ecorse,Mich. G5 .....6.35
Follansbee,W.Va. F4 ...6.25
Fontana,Calif. K1 .....8.00
FranklinPark,Ill. T6 ...6.35
Ind.Harbor,Ind. I-2 ....6.35
Ind.Harbor,Ind. Y1 ....6.45
Indianapolis C8 .....6.40
Lackawanna,N.Y. B2 ..6.25
LosAngeles C1 .....8.50
NewBedford,Mass. R10..6.70
NewBritain(10) S15 ...6.25
NewCastle,Pa. B4, E5...6.25
NewHaven,Conn. A7 ....7.00
NewHaven,Conn. D2 ....6.70
NewKensington,Pa. A6..6.25
Pawtucket,R.I. R3 .....6.90
Pawtucket,R.I. N8 .....6.80
Pittsburgh J5 .....6.45
Portsmouth,O. P12 .....6.25
Riverdale,Ill. A1 .....6.35
Rome,N.Y.(32) R6 .....6.25
Sharon,Pa. S3 .....6.25
SparrowsPt.,Md. B2 ....6.25
Trenton,N.J.(31) R5 ...7.80
Wallingford,Conn. W2 ..6.70
Warren,O. R2 T5 .....6.25
Weirton,W.Va. W6 ....6.25
Worcester,Mass. A7 ....7.10
Youngstown Y1 .....6.45
Youngstown C8 .....6.25

STRIP, Cold-Rolled Alloy

Boston T6 .....13.80
Carnegie,Pa. S18 .....13.45
Cleveland A7 .....13.45
Dover,O. G6 .....13.45
FranklinPark,Ill. T6 ...13.45
Harrison,N.J. C18 .....13.45
Indianapolis C8 .....13.60
Pawtucket,R.I. N8 ....13.80
Sharon,Pa. S3 .....13.45
Worcester,Mass. A7 ...13.75
Youngstown C8 .....13.45

STRIP, Cold-Rolled High-Strength Low-Alloy

Cleveland A7 .....9.10
Dearborn,Mich. D3 ....9.20
Dover,O. G6 .....9.30
Ecorse,Mich. G5 .....9.20

STRIP, Cold-Finished Spring Steel (Annealed)	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	7.30	9.25	10.80	12.95	15.65
Boston T6	7.55	9.25	10.80	12.95	15.65
Bristol,Conn. W1	...	...	10.80	12.95	....
Carnegie,Pa. S18	...	8.95	10.50	12.65	....
Cleveland A7	7.00	8.95	10.50	12.65	15.35
Cleveland C7	...	8.95	10.50	12.65	15.35
Dearborn,Mich. D3	7.10	9.05	10.60	....	....
Detroit D2	7.10	9.05	10.60	12.75	....
Dover,O. G6	7.00	8.95	10.50	12.65	15.35
Follansbee,W.Va. F4	7.00	8.95	10.50**	....	....
FranklinPark,Ill. T6	7.10	8.95	10.50	12.65	15.35
Harrison,N.J. C18	...	...	10.80	12.95	15.65
Indianapolis C8	7.15	9.10	10.50	12.65	15.35
NewBritain,Conn.(10) S15.	7.00	8.95	10.50	12.65	15.35
NewCastle,Pa. B4, E5	7.00	8.95	10.50	12.65	....
NewHaven,Conn. D2	7.45	9.25	10.80	12.95	....
NewKensington,Pa. A6	7.00	8.95	10.50	....	....
New York W3	...	9.25	10.80	12.95	15.65
Pawtucket,R.I. N8	7.55	9.25	10.80	12.95	15.35
Riverdale,Ill. A1	7.10	8.95	10.50	12.65	15.35
Rome,N.Y.(32) R6	7.00	8.95	10.50	12.65	15.35
Sharon,Pa. S3	7.00	8.95	10.50	12.65	15.35
Trenton,N.J. R5	...	9.25	10.80	12.95	15.65
Wallingford,Conn. W2	7.45	9.25	10.80	12.95	15.65
Warren,O. T5	7.00	8.95	10.50	12.65	15.35
Weirton,W.Va. W6	7.00	8.95	10.50	12.65	15.35
Worcester,Mass. T6	7.55	9.25	10.80	12.95	15.65
Worcester,Mass. A7	7.85	9.25	10.80	12.95	15.65
Youngstown C8	7.00	8.95	10.50	12.65	15.35

**0.065 C, max.

Spring Steel (Tempered)					
Bristol,Conn. W1	...	...	14.40	17.60	....
Buffalo W12	...	...	14.40	....	....
FranklinPark,Ill. T6	...	...	14.90	18.10	21.50
Harrison,N.J. C18	...	...	14.40	17.60	21.00
NewYork W3	...	...	14.40	17.60	21.00
Trenton,N.J. R5	...	...	14.40	17.60	21.00
Worcester,Mass. A7, T6...	...	...	14.40	17.60	21.00
Worcester,Mass. W12	...	...	14.40	....	....
Youngstown C8	...	...	14.75	17.95	21.35

STRIP, Electrogalvanized

Cleveland A7 .....6.25•
Dover,O. G6 .....6.25•
Riverdale,Ill. A1 .....6.55•
Youngstown C8 .....6.25•
Warren,O. T5 .....6.25•
Warren,O. B9 .....6.45•
Weirton,W.Va. W6 ....5.75•
Worcester,Mass. A7 ...7.10•

•Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3 .....6.55

TIGHT COOPERAGE HOOP

Atlanta A11 .....5.05
Riverdale,Ill. A1 .....4.90
Sharon,Pa. S3 .....4.75
Youngstown U5 .....4.75

SILICON STEEL

H.R. SHEETS(22 Ga.,cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10 ..	...	...	9.95	10.95	11.85
Brackenridge,Pa. A4	...	...	9.95	10.95	11.85
Mansfield,O. E6	8.40	9.35	9.95	10.95	11.85
Newport,Ky. N9	8.40	9.35	9.95	10.95	11.85
Niles,O. N12	8.40	9.35	9.95	10.95	....
Vandergrift,Pa. U5	...	9.35	9.95	10.95	11.85
Warren,O. R2	8.40	9.35	9.95	10.95	11.85
Zanesville,O. A10	...	9.35	9.95	10.95	11.85

C.R. COILS & CUT LENGTHS, (22 Ga.) Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
Brackenridge,Pa. A4	...	...	10.70	11.70	12.60
GraniteCity,Ill. G4	8.80•	9.80•	10.40•	11.40•	....
IndianaHarbor,Ind. I-2 ..	8.60†	9.60•	10.20•	11.20•	....
Vandergrift,Pa. U5	...	10.10†	10.70†	11.70†	12.60†
Vandergrift,Pa. U5	8.60•	9.60•	10.20•	11.20•	12.10•
Warren,O. R2	8.60†	10.10	10.70	11.70	12.60
Zanesville,O. A10	...	10.10	10.70	11.70	12.60

	Transformer Grade			
H.R. SHEETS (22 Ga., cut lengths)	T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	12.80	13.35	13.85	14.85
Brackenridge,Pa. A4	12.80	....	....	....
Newport,Ky. N9	12.80	....	....	....
Vandergrift,Pa. U5	12.80	13.35	13.85	14.85
Zanesville,O. A10	12.80§	13.35§	13.85§	14.85§

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-72
Brackenridge,Pa. A4	....	15.85	17.45	17.95	13.55§
Butler,Pa. A10	....	....	17.45	17.95	....
Vandergift,Pa. U5	14.85	15.85	17.45	17.95	13.55
Warren,O. R2	....	....	....	....	13.55‡

•Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. §Coils, ¾-cent higher.

TIN MILL PRODUCTS

TIN PLATE Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75
Aliquippa,Pa. J5	$7.90	$8.15	$8.4
Dravosburg,Pa. U5	7.90	8.15	8.4
Fairfield,Ala. T2	8.00	8.25	8.5
FairlessHills,Pa. U5	8.00	8.25	8.5
Gary,Ind. U5	7.90	8.15	8.4
GraniteCity,Ill. G4	8.00	8.25	8.5
IndianaHarbor,Ind. I-2, Y1	7.90	8.15	8.4
Niles,O. R2	7.90	8.15	8.4
Pittsburg,Calif. C11	8.65	8.90	9.2
SparrowsPoint,Md. B2	8.00	8.25	8.5
Weirton,W.Va. W6	7.90	8.15	8.4
Yorkville,O. W10	7.90	8.15	8.4

ELECTROTIN (22-27 Gage; Dollars per 100 lb)			
Aliquippa,Pa. J5	6.575	....	....
Niles,O. R2	7.075	7.275	7.42

TINPLATE, American Coke (Base Box)	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$9.20	$9.45
Dravosburg,Pa. U5	9.20	9.45
Fairfield,Ala. T2	9.30	9.55
Fairless,Pa. U5	9.30	9.55
Gary,Ind. U5	9.20	9.45
Ind.Har. I-2, Y1	9.20	9.45
Pitts.,Calif. C11	9.95	10.20
Sp.Pt.,Md. B2	9.30	9.55
Warren,O. R2	9.20	9.45
Weirton,W.Va. W6	9.20	9.45
Yorkville,O. W10	9.20	9.45

BLACK PLATE (Base Box)

Aliquippa,Pa. J5 .....$7.00
Dravosburg,Pa. U5 ....7.00
Fairfield,Ala. T2 .....7.10
FairlessHills,Pa. U5 .....7.10
Gary,Ind. U5 .....7.00
GraniteCity,Ill. G4 .....7.10
Ind.Harbor,Ind. I-2, Y1 7.00
Niles,O. R2 .....7.00
Pittsburg,Calif. C11 .....7.75
SparrowsPoint,Md. B2 ...7.1
Warren,O. R2 .....7.0
Weirton,W.Va. W6 .....7.0
Yorkville,O. W10 .....7.0

HOLLOWARE ENAMELING Black Plate (29 Gage)

Dravosburg,Pa. U5 ....6.6
Gary,Ind. U5 .....6.6
GraniteCity,Ill. G4 ....6.7
Ind.Harbor,Ind. Y1 ....6.6
Yorkville,O. W10 .....6.6

MANUFACTURING TERNES (Special Coated; Base Box)

Dravosburg,Pa. U5 ....$8.2
Gary,Ind. U5 .....8.2

MANUFACTURING TERNES (Light Coated, 6 lb; Base Box)

Yorkville,O. W10 .....$9.2

ROOFING SHORE TERNES (8 lb Coated; Base Box)

Gary,Ind. U5 .....$10.2

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2 ...6.25
Aliquippa,Pa. J5 .....6.25
Alton,Ill. L1 .....6.425
Atlanta A11 .....6.45
Bartonville,Ill. K4 ....6.35
Buffalo W12 .....6.25
Chicago W13 .....6.25
Cleveland A7 .....6.25
Crawfordsville,Ind. M8..6.35
Donora,Pa. A7 .....6.25
Duluth,Minn. A7 .....6.25
Fairfield,Ala. T2 .....6.25
Fostoria,O.(24) S1 ....6.45
Houston S5 .....6.50
Jacksonville,Fla. M8 ..6.77
Johnstown,Pa. B2 .....6.25
Joliet,Ill. A7 .....6.25
KansasCity,Mo. S5 ....6.50
Kokomo,Ind. C16 .....6.35
LosAngeles B3 .....7.20
Minnequa,Colo. C10 ....6.50
Monessen,Pa. P7 .....6.25
Newark 6-8 ga. I-1 ....6.90
N.Tonawanda B11 ....6.25
Palmer,Mass. W12 .....6.55
Pittsburg,Calif. C11 ....7.20
Portsmouth,O. P12 ....6.25
Rankin,Pa. A7 .....6.25
S.Chicago,Ill. R2 .....6.25
S.SanFrancisco C10 ....7.20
SparrowsPoint,Md. B2 ..6.35
Sterling,Ill.(1) N15 ....6.25
Sterling,Ill. N15 .....6.35
Struthers,O. Y1 .....6.25
Waukegan,Ill. A7 ....6.25
Worcester,Mass. A7 ....6.55

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5 .....7.90
Alton,Ill. L1 .....8.075
Bartonville,Ill. K4 ....8.00
Buffalo W12 .....7.90
Cleveland A7 .....7.90
Donora,Pa. A7 .....7.90
Duluth,Minn. A7 .....7.90
Fostoria,O. S1 .....7.95
Johnstown,Pa. B2 .....7.90
LosAngeles B3 .....8.85
Milbury,Mass.(12) N6 ...8.20
Minnequa,Colo. C10 ....8.15
Monessen,Pa. P16 .....7.90
Muncie,Ind. I-7 .....8.10
Palmer,Mass. W12 ....8.20
Pittsburg,Calif. C11 ...8.85
Portsmouth,O. P12 ....7.90
Roebling,N.J. R5 .....8.20
S.Chicago,Ill. R2 .....7.90
S.SanFrancisco C10 ....8.85
SparrowsPt.,Md. B2 ...8.00
Struthers,O. Y1 .....7.90
Trenton,N.J. A7 .....8.20
Waukegan,Ill. A7 .....7.90
Worcester A7,J4,T6,W12.8.20

WIRE, Upholstery Spring

Aliquippa,Pa. J5 .....7.60
Alton,Ill. L1 .....7.77
Buffalo W12 .....7.6
Cleveland A7 .....7.6
Donora,Pa. A7 .....7.6
Duluth,Minn. A7 .....7.6
Johnstown,Pa. B2 .....7.6
KansasCity,Mo. S5 ....7.8
LosAngeles B3 .....8.5
Minnequa,Colo. C10 ...7.77
Monessen,Pa. P16 .....7.6
NewHaven,Conn. A7 ....7.9
Palmer,Mass. W12 ....7.9
Pittsburg,Calif. C11 ....8.8
Portsmouth,O. P12 ....7.6
Roebling,N.J. R5 .....7.9
S.Chicago,Ill. R2 .....7.6
S.SanFrancisco C10 ....8.8
SparrowsPoint,Md. B2 ..7.7
Struthers,O. Y1 .....7.6
Trenton,N.J. A7 .....7.9
Waukegan,Ill. A7 .....7.6
Worcester,Mass. A7 ....7.9

WIRE, Fine & Weaving (8"Coil)

Alton,Ill. L1 .....12.75
Bartonville,Ill. K4 ....12.6
Buffalo W12 .....12.5
Chicago W13 .....12.5
Cleveland A7 .....12.5
Crawfordsville,Ind. M8.12.6
Fostoria,O. S1 .....12.5
Jacksonville,Fla. M8 ...13.6
Johnston,Pa. B2 .....12.5
Kokomo,Ind. C16 .....12.5
Minnequa,Colo. C10 ....12.3
Monessen,Pa. P16 .....12.5
Muncie,Ind. I-7 .....12.7
Palmer,Mass. W12 ....12.5
Roebling,N.J. R5 .....12.5
S.SanFrancisco C10 ....12.9
Waukegan,Ill. A7 ....12.5
Worcester,Mass. A7, T6.12.6

WIRE, Galv'd ACSR for Cores

Bartonville,Ill. K4 ....10.7
Buffalo W12 .....10.7
Johnstown,Pa. B2 .....10.7
Minnequa,Colo. C10 ...10.82
Monessen,Pa. P16 .....10.7
Muncie,Ind. I-7 .....10.9
Pittsburg,Calif. C11 ...11.4
Portsmouth,O. P12 ....10.7
Roebling,N.J. R5 .....11.0
SparrowsPt.,Md. B2 ...10.4

ROPE WIRE

Bartonville,Ill. K4 ....10.5
Buffalo W12 .....10.5
Fostoria,O.(23) S1 ....10.5
Johnstown,Pa. B2 .....10.5
Monessen,Pa. P16 .....10.5
Muncie,Ind. I-7 .....10.7
Palmer,Mass. W12 ....10.5
Portsmouth,O. P12 .....9.7
Roebling,N.J. R5 .....10.5
SparrowsPt. B2 .....10.6
Struthers,O. Y1 .....10.5
Worcester,Mass. J4 ....10.5

(A) Plow and Mild Plow add 0.25c for Improved Plow

WIRE
(Continued)

IRE, Tire Bead
artonville, Ill. K4 .....14.15
onessen, Pa. P16 .....14.20
oebling, N.J. R5 .....14.35

IRE, Cold-Rolled Flat
nderson, Ind. G6 .....9.00
altimore T6 .....9.30
uffalo W12 .....9.00
leveland A7 .....9.00
awfordsville, Ind. M8..9.00
over, O. G6 .....9.00
ostoria, O. S1 .....9.00
anklinPark, Ill. T6 . . .9.10
okomo, Ind. C16 .....9.00
assillon, O. R8 .....9.00
lwaukee C23 .....9.20
onessen, Pa. P16 .....9.00
wtucket, R.I. N8 .....9.30
verdale, Ill. A1 .....9.10
me, N.Y. R6 .....9.00
enton, N.J. R5 .....9.30
orcester A7, T6, W12.9.30

AIL, Stock
To Dealers & Mfrs. (7) Col.
abamaCity, Ala. R2 ...152
iquippa, Pa. J5 152
lanta A11 154
rtonville, Ill. K4 154
icago, Ill. W13 152
eveland A9 157
awfordsville, Ind. M8 ..154
nora, Pa. A7 152
luth, Minn. A7 152
rfield, Ala. T2 152
lveston, Tex. D7 157
uston, Tex. S5 157
nstown, Pa. B2 152
iet, Ill. A7 152
nsasCity, Mo. S5 157
komo, Ind. C16 154
nnequa, Colo. C10 157
nessen, Pa. P7 152
tsburg, Calif. C11 171
nkin, Pa. A7 152
hicago, Ill. R2 152
arrowsPt., Md. B2 154
rling, Ill. (1) N15 152
rcester, Mass. A7 158

ILS, CUT (100 lb keg)
To Dealers (33)
shohocken, Pa. A3 ..$9.05
eeling, W.Va. W10 ..9.05

PLES, Polished Stock
To Dealers & Mfrs. (7) Col.
quippa, Pa. J5 152
anta A11 154
tonville, Ill. K4 154
wfordsville, Ind. M8 ..154
nora, Pa. A7 152
luth, Minn. A7 152
rfield, Ala. T2 152
nstown, Pa. B2 152
et, Ill. A7 152
komo, Ind. C16 154
nnequa, Colo. C10 157
nessen, Pa. P7 152
tsburg, Calif. C11 171
nkin, Pa. A2 152
rrowsPt., Md. B2 154
rling, Ill. (1) N15 152
rcester, Mass. A7 158

WIRE, Automatic Baler
½ Ga.) (Per 97 lb Net Box)
Coil No. 3150
bamaCity, Ala. R2 ..$9.35
tonville, Ill. K4 .....9.45
falo W12 .....9.35
wfordsville, Ind. M8..9.46
ora, Pa. A7 .....9.35
uth, Minn. A7 .....9.35
nstown, Pa. B2 .....9.35
et, Ill. A7 .....9.35
omo, Ind. C16 .....9.45
Angeles B3 .....10.14
nequa, Colo. C10 ....9.60
tsburg, Calif. C11 ...10.43
nicago, Ill. R2 .....9.35
rrowsPt., Md. B2....9.45
rling, Ill. N15 .....9.35

Coil No. 6500 Stand.
bamaCity, Ala. R2..$9.65
tonville, Ill. K4 .....9.75
falo W12 .....9.60
wfordsville, Ind. M8..9.75
ora, Pa. A7 .....9.65
uth, Minn. A7 .....9.65
nstown, Pa. B3 .....9.65
et, Ill. A7 .....9.65
omo, Ind. C16 .....9.75
Angeles B3 .....10.45
nequa, Colo. C10 ....9.90
tsburg, Calif. C11 ...10.13
nicago, Ill. R2 .....9.65
rrowsPt., Md. B2 ....9.75
rling, Ill. N15 .....9.65

Coil No. 6500 Interim
bamaCity, Ala. R2 ..$9.70
onville, Ill. K4 .....9.80
falo W12 .....9.70

Crawfordsville, Ind. M8 ..9.80
Donora, Pa. A7 .....9.70
Duluth, Minn. A7 .....9.70
Johnstown, Pa. B2 .....9.70
Joliet, Ill. A7 .....9.70
Kokomo, Ind. C16 .....9.80
LosAngeles B3 .....10.50
Minnequa, Colo. C10 ....9.95
Pittsburg, Calif. C11 ...10.50
S.Chicago, Ill. R2 .....9.70
SparrowsPt., Md. B2 ....9.80
Sterling, Ill. N15 .....9.70

WIRE, Barbed **Col.**
AlabamaCity, Ala. R2..175**
Aliquippa J5 .....172§
Atlanta A11 181
Bartonville, Ill. K4 181
Crawfordsville, Ind. M8 ..181
Donora, Pa. A7 .....175†
Duluth, Minn. A7 .....175†
Fairfield, Ala. T2 .....175†
Houston, Tex. S5 .....180†
Johnstown, Pa. B2 .... 179*
Joliet, Ill. A7 .....175†
KansasCity, Mo. S5 ....180†
Kokomo, Ind. C16 .....177†
Minnequa, Colo. C10 ...180**
Monessen, Pa. P7 .....179*
Pittsburg, Calif. C11 ...195†
Rankin, Pa. A7 .....175†
S.Chicago, Ill. R2 .....175**
S.SanFrancisco C10 ...195**
SparrowsPoint, Md. B2 ..181*
Sterling, Ill. (1) N15 ....179*

WOVEN Fence, 9-15 Ga. **Col.**
Ala.City, Ala. R2 .....162**
Ala.City, 17 ga. R2 ...241**
Ala.City, 18 ga. R2 ...251**
Aliq'ppa, Pa. 9-14½ga J5 165§
Atlanta A11 168
Bartonville, Ill. K4 168
Crawfordsville, Ind. M8 ..168
Donora, Pa. A7 .....162†
Duluth, Minn. A7 .....162†
Fairfield, Ala. T2 .....162†
Houston, Tex. S5 .....167†
Johnstown, Pa. (43) B2 ..166
Joliet, Ill. A7 .....162†
KansasCity, Mo. S5 ....167†
Kokomo, Ind. C16 .....164†
Minnequa, Colo. C10 ...167**
Monessen, Pa. 9 ga. P17.166*
Pittsburg, Calif. C11 ...185†
Rankin, Pa. A7 .....162†
S.Chicago, Ill. R2 .....162**
Sterling, Ill. (1) N15 ....166*

WIRE (16 Gage)	An'ld Galv. Stone	Galv. Stone
Ala.City R2	14.50	16.05**
Bartonville K4	14.60	16.50
Buffalo W12	14.50	....
Cleveland A7	14.50	....
Crawf'dsville M8	14.60	16.50
Fostoria, O. S1	14.60	16.15†
Johnstown B2	14.15	16.40*
Kokomo C16	14.60	16.15†
Minnequa C10	14.75	16.45**
Palmer, Mass W12	14.50	16.05*
Pitts., Calif. C11	14.85	16.40†
S.Chicago R2	14.50	16.05**
SparrowsPt. B2	14.60	16.50*
Sterling (1) N15	14.50	16.45††
Waukegan A7	14.50	16.05†
Worcester A7	14.80	....

WIRE, Merchant Quality

(6 to 8 gage)	An'ld Galv.
Ala.City, Ala. R2	7.40 7.80**
Aliquippa J5	7.40 7.925§
Atlanta A11	7.50 8.075
Bartonville (48) K4	7.50 8.075
Buffalo W12	7.40 8.80†
Cleveland A7	7.40 ....
Crawfordsville M8	7.50 8.075
Donora, Pa. A7	7.40 7.80†
Duluth, Minn. A7	7.40 7.80†
Fairfield T2	7.40 7.80†
Houston, Tex. S5	7.65 8.05†
Jacksville, Fla. M8	7.90 8.475
Johnstown B2 (48)	7.40 7.975*
Joliet, Ill. A7	7.40 7.80†
KansasCity, Mo. S5	7.65 8.05†
Kokomo C16	7.50 7.90†
LosAngeles B3	8.35 8.925*
Minnequa C10	7.65 8.05**
Monessen P7 (48)	7.40 7.975*
Palmer, Mass. W12	7.70 8.10†
Pitts., Calif., C11	8.35 8.75†
Portsmouth, O. P12	7.40 ....
Rankin A7	7.40 7.80†
S.Chicago R2	7.40 7.80**
S.SanFran. C10	8.35 8.75**
Spar'wsPt. B2 (48)	7.50 8.075*
Str'ling (1) (48) N15	7.40 8.00††
Struthers, O. (48) Y1	7.40 7.90‡
Worcester, Mass. A7	7.70 ....

*Based on 12.50c zinc; †5c zinc; §10c zinc; ‡Less than 10c zinc; **Subject to zinc equalization extras. ††13c zinc.

BALE TIES, Single Loop **Col.**
AlabamaCity, Ala. R2 ...173
Atlanta A11 175
Bartonville, Ill. K4 175
Crawfordsville, Ind. M8 ..175
Donora Pa A7 173
Duluth, Minn. A7 173
Fairfield Ala. T2 173
Joliet, Ill. A7 173
Houston S5 178
KansasCity, Mo. S5 178
Kokomo, Ind. C16 175
Minnequa, Colo. C10 178
S.Chicago R2 173
S.SanFran., Calif. C10 ..197
SparrowsPoint, Md. B2 ..175
Sterling, Ill. (1) N15 173

BOLTS, NUTS

CARRIAGE, MACHINE BOLTS
(Base discounts, less case lots, per cent off list, f.o.b. midwestern plants)
4" and shorter:
½" & smaller diam... +5
Over 4" through 6":
½" and smaller diam. +12
6" and shorter:
⅝" and ⅝" .....+13
¾" and larger .....+16
Longer than 6":
All diameters .....+25
Lag bolts, all diams:
6" and shorter ..... +2
Over 6" long .....+11
Ribbed Necked Carriage. +13
Blank 2
Plow 18
Step, Elevator, Tap and Sleigh Shoe 2
Tire Bolts 12
Boiler & Fitting-Up Bolts 14

NUTS
H.P. and C.P., regular & heavy:
Square, all sizes 51
H.P., Hex. regular & heavy:
¾" and smaller 55
⅞" to 1⅛", inclusive. 55
1¼" to 1½", inclusive 57
1⅝" and larger 51
C.P. Hex regular & heavy:
¾" and smaller 55
Larger than ¾" 51
Hot Galv. Nuts (all types):
¾" or smaller 38
⅞" to 1½", inclusive. 36
Finished Hex Nuts:
¾" and smaller 55
⅞" and larger 51
Semifinished & Slotted Hex:
Regular and heavy,
¾" and smaller ... 55
⅞" and larger 51

STEEL STOVE BOLTS
(F.o.b. plant, per cent off list in packages; plain finish)
3" and shorter:
⅛" thru ¼" diam, 25,000 to 200,000 pieces 61
Over 200,000 pieces. 64
5/32" thru ½" diam: 15,000 to 100,000 pieces 61
100,000 or more ... 64
Longer than 3", any diam:
5000 to 100,000 pieces 61
Over 100,000 pieces. 64

RIVETS

F.o.b. Cleveland, and/or freight equalized with Pittsburgh, f.o.b. Chicago, and/or freight equalized with Birmingham except where equalization is too great.
Structural ½-in., larger 9.95
7/16-in. under..List less 32%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft. mill; minimum wall thickness, cut lengths 10 to 24 ft inclusive.

O.D.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	21.06	20.41
1¼	13	....	24.94	20.44
1½	13	23.31	27.57	22.60
1¾	13	27.54	32.57	26.71
2	13	30.87	36.51	29.93
2¼	13	34.77	41.12	33.72
2½	12	37.73	44.63	36.59
2½	12	41.57	49.16	40.31
2¾	12	45.00	53.22	43.65
3	12	47.99	56.76	46.54

RAILWAY MATERIALS

	Standard No.	Standard No. 2	Tee Rails All No. 2	Tee Rails 60 lb Under
RAILS				
Bessemer, Pa. U5	4.725	4.625	4.675	5.65
Ensley, Ala. T2	4.725	4.625	...	5.65
Fairfield, Ala. T2	...	...	...	5.65
Gary, Ind. U5	4.725	...	...	...
Huntington, W.Va. W7	...	...	...	5.65
Indiana Harbor, Ind. I-2	4.725	4.625	4.675	..
Johnstown, Pa. B2	...	...	...(16)	5.65
Lackawanna, N.Y. B2	4.725	4.625	...	5.65
Minnequa, Colo. C10	4.725	4.625	...	6.15
Steelton, Pa. B2	4.725	4.625	...	...
Williamsport, Pa. S19	...	...	...	5.65

TIE PLATES
Fairfield, Ala. T2 .....5.625
Gary, Ind. U5 .....5.625
Ind. Harbor, Ind. I-2 ...5.625
Lackawanna, N.Y. B2 ..5.625
Minnequa, Colo. C10 ...5.625
Seattle B3 .....5.775
Steelton, Pa. B2 .....5.625
Torronce, Calif. C11 ...5.775

TRACK BOLTS (20) Treated
Cleveland R2 .....12.40
KansasCity, Mo. S5 ....12.40
Lebanon, Pa. B2 .....12.40
Minnequa, Colo. C10 ...12.40
Pittsburgh O3, P14 ....12.40
Seattle B3 .....12.90

AXLES
Ind. Harbor, Ind. S13 ....7.25
Johnstown, Pa. B2 .....7.25

JOINT BARS
Bessemer, Pa. U5 .....5.825
Fairfield, Ala. T2 .....5.825
Ind. Harbor, Ind. I-2 ...5.825
Joliet, Ill. U5 .....5.825
Lackawanna, N.Y. B2 ..5.825
Minnequa, Colo. C10 ...5.825
Steelton, Pa. B2 .....5.825

SCREW SPIKES
Cleveland R2 .....11.90
Pittsburgh O3 .....11.90

STANDARD TRACK SPIKES
Fairfield, Ala. T2 .....7.90
Ind. Harbor, Ind. I-2, Y1.7.90
KansasCity, Mo. S5 .....7.90
Lebanon, Pa. B2 .....7.90
Minnequa, Colo. C10 ....7.90
Pittsburgh J5 .....7.90
Seattle B3 .....8.40
S.Chicago, Ill. R2 .....7.90
Struthers, O. Y1 .....7.90
Youngstown R2 .....7.90

METAL POWDER

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as otherwise noted)

	Cents
Sponge iron:	
98+% Fe, annealed.	15.25
Unannealed:	
Minus 100 mesh	11.75
Minus 35 mesh	9.25
Minus 20 mesh	9.00
Swedish, c.i.f. Camden, N. J., c.l. in bags..	*9.50*
Domestic (Swedish), f.o.b. Riverton, N.J., in bags	9.50
Canadian, f.o.b. shipping point	9.50
Electrolytic iron:	
Melting stock, 99.9% Fe, irregular fragments of ⅛ in. x 1.3 in.	*22.00*
Annealed, 99.5% Fe.	36.50
Unannealed (99+% Fe)	32.50
Unannealed (99+% Fe) (minus 325 mesh)	52.00
Powder Flakes (minus 16, plus 100 mesh)..	31.00
Carbonyl Iron:	
97.9-99.8% size 5 to 10 microns..83.00-148.00	
Aluminum:	
Atomized, 500 lb drum, frght. allowed	
Carlots	*34.50*
Ton lots	*36.50*
Antimony, 500 lb lots	32.00*
Brass, 5000-lb lots	*38.00-50.00†*
Bronze, 5000-lb lots	*61.50-64.75†*
Copper:	
Electrolytic	13.75*
Reduced	13.75*
Lead	7.50*
Manganese:	
Minus 35 mesh	61.00
Minus 100 mesh	67.00
Minus 200 mesh	72.00
Nickel, unannealed ...	94.00
Nickel-Silver, 5000-lb lots	*58.75-62.75†*
Phosphor-Bronze, ¼-ton lots	58.50
Silicon	43.50
Solder	7.00*
Stainless Steel, 302...	94.00
Stainless Steel, 316...	$1.25
Tin	14.50*
Zinc, 5000-lb lots	*18.75-32.50‡*
Tungsten	Dollars
Melting grade, 99% 60 to 200 mesh:	
1000 lb and over...	4.50
Less than 1000 lb..	4.65
Chromium, electrolytic 99.2% Cr min.	3.50

*Plus cost of metal. †Depending on composition. ‡Depending on mesh. §70% Cu, 20% Zn, 10% Ni; **64% Cu, 18% Zn, 18% Ni.

Footnotes

(1) Chicago Base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(6) Chicago or Birm. base.
(7) To jobbers, 3 cols. lower.
(8) 16 Ga. and heavier.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅝" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(20) 0.25 off for untreated.
(21) New Haven, Conn., base.
(22) Deld San Francisco Bay area.
(23) Mild plow, 10.55c.
(24) Deduct 0.10c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 5.10c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c for carbon, add 0.40c for alloy and 0.45c H.S.-L.A.
(31) Widths over ⅝-in.; 6.90c for widths ⅝-in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) 13 Ga. & heavier; 60" & narrower.
(38) 14 Ga. & lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.25c.
(43) 9-14½ Ga.
(48) 6-7 Ga.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft.	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	6.5	+10	10.5	+7.25	13	+4.75	14.5	+3.25	14.5	+3.25	14	+3.75	16.5	+1..
Ambridge, Pa. N2	6.5	..	10.5	...	13	...	14.5	...	14.5	...	14	...	16.5	..
Lorain, O. N3	6.5	+10	10.5	+7.25	13	+4.75	14.5	+3.25	14.5	+3.25	14	+3.75	16.5	+1..
Youngstown Y1	6.5	+10	10.5	+7.25	13	+4.75	14.5	+3.25	14.5	+3.25	14	+3.75	16.5	+1..

ELECTRIC WELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	6.5	+10	10.5	+7.25	13	+4.75	14.5	+3.25	14.5	+3.25	14	+3.75	16.5	+1..

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	...	...	....	....	....	....	17.5	0.25	20.5	4.25	23	7.75	25.5	9
Alton, Ill. L1	...	...	....	....	....	....	15.5	+1.75	18.5	2.25	21	5.75	23.5	7
Benwood, W. Va. W10..	16.5	+12	7.25	+18.25	+1.75	+26.25	17.5	0.25	20.5	4.75	23	7.75	25.5	7
Butler, Pa. F6	17.5	+11	9	+16.5	0.5	+24	...	...	...	...	...	...	...	..
Etna, Pa. N2	...	...	....	....	....	....	17.5	0.25	20.5	4.25	23	7.75	25.5	9
Fairless Hills, Pa. N3	...	...	....	....	....	....	15.5	+1.75	18.5	2.75	21	5.75	23.5	7
Fontana, Calif. K1	...	...	....	....	....	....	6	+11.25	9	+7.25	11.5	+3.75	14	+2..
Ind. Harbor, Ind. Y1	...	...	....	....	....	....	16.5	+0.75	19.5	3.25	22	6.75	24.5	8
Lorain, O. N3	...	...	....	....	....	....	17.5	0.25	20.5	4.25	23	7.75	25.5	9
Sharon, Pa. S4	17.5	+11	9	+16.5	0.5	+24	...	...	...	...	...	...	...	..
Sharon, Pa. M6	...	...	....	....	....	....	17.5	0.25	20.5	4.25	23	7.75	25.5	9
Sparrows Pt., Md. B2...	15.5	+13	7	+18.5	+1.5	+26	15.5	+1.75	18.5	2.25	21	5.75	23.5	7
Youngstown R2, Y1	...	...	....	....	....	....	17.5	0.25	20.5	4.25	23	7.75	25.5	9
Wheatland, Pa. W9	17.5	+11	9	+16.5	0.5	+24	17.5	0.25	20.5	4.25	23	7.75	25.5	9

Size—Inches	1¼		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	26	10	26.5	10.5	28	10.75	28	10.75	....	...	....	..
Alton, Ill. L1	24	8	24.5	8.5	26	8.75	26	8.75	....	...	....	..
Benwood, W. Va. W10...	26	10	26.5	10.5	28	10.75	28	10.75	18.5	0.75	18.5	0..
Etna, Pa. N2	26	10	26.5	10.5	28	10.75	28	10.75	18.5	0.75	18.5	0..
Fairless Hills, Pa. N3....	24	8	24.5	8.5	26	8.75	26	8.75	16.5	+1.25	16.5	+1..
Fontana, Calif. K1	14.5	+1.5	15	+1	16.5	+0.75	16.5	+0.75	7	+10.75	7	+10..
Ind. Harbor, Ind. Y1	25	9	25.5	9.5	27	9.75	27	9.75	17.5	+0.25	17.5	+0..
Lorain, O. N3	26	10	26.5	10.5	28	10.75	28	10.75	....	...	....	..
Sharon, Pa. M6	26	10	26.5	10.5	28	10.75	28	10.75	....	...	....	..
Sparrows Pt., Md. B2 ...	24	8	24.5	8.5	26	8.75	26	8.75	16.5	+1.25	16.5	+1..
Youngstown R2, Y1	26	10	26.5	10.5	28	10.75	28	10.75	18.5	0.75	18.5	0..
Wheatland, Pa. W9	26	10	26.5	10.5	28	10.75	28	10.75	18.5	0.75	18.5	0..

*Galvanized pipe discounts based on current price of zinc (13.00c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	Rerolling Ingots	Rerolling Slabs, Billets	Forging Billets	Seamless Tube Billets	Shapes; H.R. & C.F. Bars; H.R. Strip	Shapes; H.R. & C.F. Bars; Wire	Plates	Sheets	C.R. Strip; Flat Wire
201	17.00	21.50	....	....	31.00	....	....	42.25	39.00
202	18.25	24.00	31.00	36.25	33.50	36.75	38.75	42.50	42.50
301	17.75	22.25	....	36.75	32.00	38.00	....	44.25	41.00
302	19.00	24.75	32.00	37.25	34.50	38.25	40.25	44.50	44.50
302B	20.25	26.50	33.00	37.25	37.75	38.25	40.25	47.00	47.00
303	....	26.75	34.75	40.00	....	41.00	....	....	....
304	20.25	26.00	33.75	39.00	37.25	40.25	43.00	47.25	47.25
304L	....	....	38.75	44.00	42.25	45.25	48.00	52.25	52.25
305	21.75	28.25	....	39.50	40.25	40.25	43.50	50.25	50.25
308	22.00	29.00	38.50	44.25	41.25	45.50	49.75	52.00	52.00
309	29.50	38.25	46.75	53.50	53.50	54.75	58.25	67.00	67.00
309S	31.50	41.00	51.00	59.00	58.50	60.25	63.75	74.00	74.00
310	37.25	48.00	62.25	72.25	68.50	73.50	75.25	78.75	78.75
314	....	....	....	....	....	....	75.25	....	....
316	31.50	40.25	51.25	59.50	58.25	60.75	64.00	68.25	68.25
316L	....	....	56.25	64.75	63.25	65.75	69.25	73.25	73.25
317	37.25	48.25	62.75	72.75	73.50	74.50	77.00	83.75	83.75
321	25.00	32.00	38.25	44.00	44.25	45.25	49.25	54.25	54.25
18-8CbTa	29.25	38.00	45.75	52.25	53.25	53.50	58.00	66.50	66.50
403	....	....	28.75	32.75	....	34.00	36.25	....	44.00
405	17.50	23.00	26.75	31.00	32.25	32.00	33.75	42.25	42.25
410	15.00	19.50	25.50	29.50	28.00	30.50	31.75	36.25	36.25
416	....	....	26.00	30.00	....	31.00	....	....	....
420	23.50	30.25	31.00	36.00	37.75	37.25	40.75	56.00	56.00
430	15.25	19.75	26.00	30.00	28.75	31.00	32.25	36.75	36.75
430F	....	....	26.50	30.50	....	31.50	....	....	....
431	16.00	20.50	26.50	30.50	29.75	31.50	33.00	38.00	38.00
446	....	....	35.50	40.50	53.25	42.00	43.25	63.25	63.25

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Co. Inc.; Alloy Tube Div., Carpenter Steel Co.; American Steel & Wire Div., U. S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; G. O. Carlson Inc.; Carpenter Steel Co.; Charter Wire Products Co.; Cold Metal Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Ellwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McLouth Steel Corp.; Metal Forming Corp.; McInnes Steel Co.; National-Standard Co.; National Tube Div., U. S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Tube Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Rotary Electric Steel Co.; Sharon Steel Corp.; Sawhill Tubular Products Inc.; Simonds Saw & Steel Co., Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Superior Steel Corp.; Superior Tube Co.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Ulbrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Clad Steel

	Plates, Carbon Base 10%	Plates, Carbon Base 20%	Sheets, Carbon Base 20%
Stainless:			
302	....	....	30.50
304	30.30	36.05	32.50
304-L	32.30	37.95	....
310	41.30	47.00	....
316	35.50	41.40	47.00
316-L	40.00	46.10	....
316-CB	41.15	48.45	....
321	32.00	37.75	37.25
347	34.40	41.40	48.25
405	25.80	33.35	....
410	25.30	32.85	....
430	25.30	32.85	....
Inconel	49.45	65.45	....
Nickel	41.05	55.65	....
Nickel, Low Carbon	43.25	60.05	....
Monel	42.35	56.35	....
Copper*	....	....	46.00

	Strip, Carbon Base—Cold Rolled 10%	Strip, Carbon Base—Cold Rolled Both Sides
Copper*	30.00	38.00

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del., C22, Coatesville, Pa. L7, New Castle, Ind. I-4 and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per
Regular carbon	0.275	5%Cr Hot Work	0.430-0.4..
Extra Carbon	0.330	W-Cr Hot Work	0.43..
Special Carbon	0.390	V-Cr Hot Work	0.4..
Oil Hardening	0.430	Hi-Carbon-Cr	0.7..

Grade by Analysis (%)

W	Cr	V	Co	Mo	$ per
20.25	4.25	1.6	12.25	...	4.0..
18.25	4.25	1	4.75	...	2.305-2.4..
18	4	2	9	...	2.675-2.67..
18	4	2	....	...	1.7..
18	4	1	....	...	1.6..
13.75	3.75	2	5	...	2.2..
13.5	4	3	....	...	1.8..
9	3.5	..	....	...	1.1..
6	4	2	....	5	1.1..
6	4	3	....	6	1.3..
1.5	4	1	....	8.5	0.9..

Tool steel producers include: A4, A8, B2, B8, C4, C.. C13, C18, D4, F2, J3, M14, S8, U4, V2 and V3.

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate and do not include 3% federal tax.

	Basic	No. 2 Foundry	Malle-able	Besse-mer
Birmingham District				
AlabamaCity,Ala. R2	54.50	55.00‡	....	....
Birmingham R2	54.50	55.00‡	....	....
Birmingham U6	....	55.00‡	59.00	....
Woodward,Ala. W15	54.50	55.00‡	59.00	....
Cincinnati, deld.	....	62.70	....	....
Buffalo District				
Buffalo H1, R2	58.50	59.00	59.50	60.00
Tonawanda,N.Y. W12	58.50	59.00	59.50	60.00
N.Tonawanda,N.Y. T9	....	59.00	59.50	60.00
Boston, deld.	69.15	69.65	70.15	....
Rochester,N.Y. deld.	61.52	62.02	62.52	....
Syracuse,N.Y. deld.	62.62	63.12	63.62	....
Chicago District				
Chicago I-3	58.50	59.00	59.00	59.50
Gary,Ind. U5	58.50	....	59.00	....
S.Chicago R2	58.50	....	59.00	....
S.Chicago,Ill. Y1	58.50	59.00	59.00	59.50
S.Chicago,Ill. U5, W14	58.50	....	59.00	59.50
Milwaukee, deld.	60.67	61.17	61.17	61.67
Muskegon,Mich. deld.	....	65.30	65.30	....
Cleveland District				
Cleveland A7, R2	58.50	59.00	59.00	59.50
Akron,O., deld.	61.25	61.75	61.75	62.25
Lorain,O. N3	58.50	....	....	59.50
Mid-Atlantic District				
Bethlehem,Pa. B2	60.50	61.00	61.50	62.00
NewYork, deld.	....	64.78	65.28	....
Newark, deld.	63.52	64.02	64.52	65.02
Birdsboro,Pa. B10	60.50	61.00	61.50	62.00
Chester,Pa. C31	54.50	55.00	55.50	....
Philadelphia, deld.	56.16	56.66	57.16	....
Steelton,Pa. B2	60.50	61.00	61.50	62.00
Swedeland,Pa. A3	60.50	61.00	61.50	62.00
Philadelphia, deld.	62.16	62.66	63.16	63.66
Troy,N.Y. R2	60.50	61.00	61.50	62.00
Pittsburgh District				
NevilleIsland,Pa. P6	58.50	59.00	59.00	....
Pittsburgh (N&S sides), Aliquippa, deld.	....	60.37	60.37	60.87
McKeesRocks, deld.	....	60.04	60.04	60.54
Lawrenceville,Homestead, Wilmerding,Monaca, deld.	....	60.66	60.66	61.16
Verona,Trafford, deld.	60.69	61.19	61.19	61.69
Brackenridge, deld.	60.95	61.45	61.45	61.95
Bessemer,Pa. U5	58.50	....	59.00	59.50
Clairton,Rankin,S.Duquesne,Pa. U5	58.50	....	....	....
McKeesport,Pa. N3	58.50	....	....	59.50
Midland,Pa. C18	58.50	....	....	....

Youngstown District	Basic	No. 2 Foundry	Malle-able	Besse-mer
Hubbard,O. Y1	....	....	59.00	....
Sharpsville,Pa. S6	58.50	....	59.00	59.50
Youngstown Y1	....	....	59.00	59.50
Youngstown U5	58.50	....	....	59.50
Mansfield,O., deld.	63.40	....	63.90	64.40
Duluth I-3	58.50	59.00	59.00	59.50
Erie,Pa. I-3	58.50	59.00	59.00	59.50
Everett, Mass. E1	*62.00*	*62.50*	*63.00*	....
Fontana,Calif. K1	64.50	65.00	....	....
Geneva,Utah C11	58.50	59.00	....	....
GraniteCity,Ill. G4	60.40	60.90	61.40	....
Ironton,Utah C11	58.50	59.00	....	....
LoneStar,Texas L6	....	55.00*	....	....
Minnequa,Colo. C10	60.50	61.00	61.50	....
Rockwood,Tenn. T3	....	55.00‡	59.00	....
Toledo,O. I-3	58.50	59.00	59.00	59.50
Cincinnati, deld.	64.26	64.76	....	....

*Phos. 0.51-0.75%; $56, Phos. 0.31-0.50%.
‡Intermediate (Phos. 0.31-0.69%), $56.

PIG IRON DIFFERENTIALS

Silicon: Add 50 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.50% manganese over 1% or portion thereof.

Nickel: Under 0.05% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1 for each 0.5% Si; 75 cents for each 0.50% Mn over 1%)

Jackson,O. G2, J1	$67.50
Buffalo H1	68.75

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

NiagaraFalls,N.Y. P15	$80.50
Keokuk,Iowa, (Open-hearth & Fdry, freight allowed K2)	87.50
Keokuk, O.H. & Fdry, 12½ lb piglets, 16% Si, frgt allowed K2	90.50

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$72.50
Steelton,Pa. B2 (Phos. 0.035% max)	66.50
Philadelphia, deld.	70.05
Troy,N.Y. R2 (Phos. 0.035% max)	66.50
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	63.50
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	63.50
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	63.50

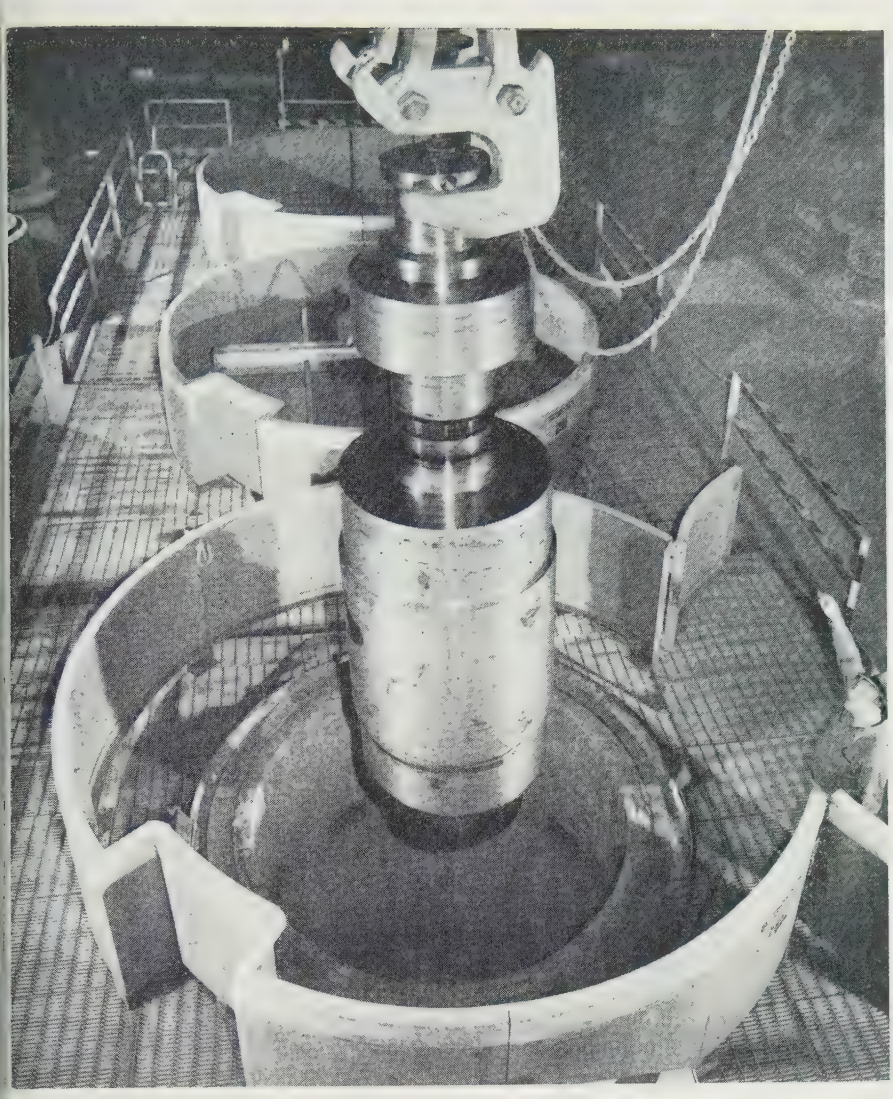
Warehouse Steel Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 25 cents per 100 lb except: Buffalo, Cleveland, Erie, 30 cents; Moline, Norfolk, Richmond, Washington, 20 cents; Birmingham, Chattanooga, Jackson, 15 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, San Francisco, 10 cents; Atlanta, Houston, Seattle, Spokane, no charge.

	SHEETS				STRIP		BARS			Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Galv. 10 Ga.†	Stainless Type 302	H.R.*	C.R.*	H.R. Rds.	C.F. Rds.‡	H.R. Alloy 4140††[5]		Carbon	Floor
Atlanta	7.14	8.20	8.87	....	7.40	...	7.42	9.39	....	7.63	7.49	9.48
Baltimore	7.03	8.32	9.10	....	7.65	...	7.61	8.62[3]	13.44	7.93	7.21	8.87
Birmingham	6.80	7.90	8.85	....	7.06	...	7.08	9.35	....	7.28	6.99	9.10
Boston	7.70	8.81	10.27	45.67	7.96	...	7.83	9.53	14.45	8.13	7.89	9.36
Buffalo	6.80	8.05	9.77	....	7.15	...	7.10	7.90	13.10	7.40	7.15	8.70
Chattanooga	6.95	8.10	8.60	....	7.20	...	7.20	9.18	....	7.45	7.25	9.05
Chicago	6.80	8.09	8.50	49.05	7.06	...	7.08	7.75	12.85	7.28	6.99	8.46
Cincinnati	6.92	8.08	8.90	46.10	7.30	...	7.32	8.05	13.09	7.75	7.28	8.71
Cleveland	6.80	8.09	8.85	49.16	7.16	...	7.14	7.85	12.91	7.61	7.16	8.63
Detroit	6.99	8.28	8.78	43.50	7.34	...	7.36	8.04	13.05	7.75	7.27	8.65
Erie, Pa.	6.80	7.90	8.85	....	7.15	...	7.08	7.85	....	7.40	7.15	8.63
Houston	7.85	8.75	10.49	....	8.15	...	8.25	9.85	14.00	8.20	7.80	9.20
Jackson, Miss.	7.10	8.20	9.20	....	7.40	...	7.40	9.44	....	7.60	7.45	9.30
Los Angeles	8.05	10.00	11.00	....	8.35	...	8.05	11.25	14.25	8.30	8.05	10.25
Milwaukee	6.89	8.18	8.59	....	7.15	...	7.17	7.94	12.94	7.45	7.08	8.55
Moline, Ill.	7.15	8.28	8.85	....	7.41	...	7.43	8.10	....	7.63	7.34	...
New York	7.46	8.68	9.44	44.95	8.07	...	7.96	9.48	13.28	7.99	7.76	9.19
Norfolk, Va.	7.25	...	...	....	7.65	...	7.65	9.50	....	7.95	7.45	8.95
Philadelphia	7.14	8.42	9.35	45.98	7.67	9.02	7.64	8.46	13.16	7.74	7.37	8.69**
Pittsburgh	6.80	8.09	9.20	49.00	7.16	...	7.08	7.85	12.85	7.28	6.99	8.46
Portland, Oreg.	7.80	8.80	10.65	....	8.00	...	7.95	11.80	15.00	7.85	7.75	9.60
Richmond, Va.	7.00	...	9.47	....	7.65	...	7.70	8.85	....	7.95	7.20	9.10
St. Louis	7.09	8.38	9.19	43.89	7.35	...	7.37	8.14	13.14	7.68	7.28	8.75
St. Paul	7.46	8.59	9.16	....	7.72	...	7.74	8.51	13.51	7.94	7.65	9.12
San Francisco	8.10	9.65	10.15	51.65	8.35	...	8.05	11.20	14.25[3]	8.25	8.05	10.25
Seattle	8.55	10.40	10.80	54.00	8.65	...	8.35	11.70	14.60	8.30	8.20	10.10
Spokane	8.55	11.00[7]	10.80	....	9.05	...	8.35	11.80	15.35	8.30	8.20	10.60
Washington	7.50	8.79	7.97	....	8.12	...	8.08	9.09	....	8.40	7.68	9.34

Prices do not include gage extras; †prices include gage and coating extras (based on 12.50-cent zinc), except in Birmingham (coating extra excluded); ‡includes 35-cent special bar quality extras; **⅛-in. and heavier; ††as annealed; §§under ½-in.

Base quantities, 2000 to 4999 lb except as noted; Cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York and Boston, 10,000 lb, and in San Francisco, 2000 to 4999 lb; Hot-rolled products on West Coast, 2000 to 9999 lb; [2]—500 to 9999 lb; [3]—400 to 999 lb; [4]—4000 lb and over; [5]—1000 to 1999 lb; [6]—1000 lb and over; [7]—1500 to 3999 lb; [8]—2000 to 3999 lb; [9]—f.o.b. local delivery in lots of 10,000 lb and over.



One of three new heat treating furnaces installed in forging division of U. S. Steel Corp.'s Homestead District Works receives a 90-ton generator rotor

Forging Capacity Expanded

U. S. STEEL CORP. is strengthening its position as a supplier of steel forgings. It's expanding its forgings division at its Homestead (Pa.) District Works.

The expansion will round out the Homestead forging division's product lines and increase flexibility for producing special forgings for the armed services, as well as turbine and generator rotors, heavy machinery parts, rolls and sleeves and plant maintenance equipment.

Big Furnaces—The improvement program includes installation of large vertical heat treating furnaces with an adjoining quenching tower. The gas-fired, 30-ft-high furnaces can heat treat 90-ton rotors in a vertical position. The furnaces are controlled automatically.

After forgings are heat treated in the cylindrically shaped furnaces, they are conditioned further by pressure spraying in the quenching tower. Location of the quenching tower adjacent to the furnaces prevents excessive cooling of the forgings in transfer.

Better Tools—In addition to improvements in vertical and horizontal heat treating furnaces, the program includes relocation and alteration of forging presses and installation of heavy-duty machine tools, such as turning and boring lathes, planer millers and vertical boring mills.

The Homestead District Works has produced heavy forgings since 1898. There was a major expansion of facilities during the early part of World War II to increase production of naval armor, ship propulsion shafting and turbine and generator rotors.

U. S. Steel produces forgings at its Gary, Ind., Works also. Its annual steel forging capacities on Jan. 1, 1954, were: Gary, 60,100 tons; and Homestead, 66,000 tons.

More Business—The increased demand this year for steel extends to forgings, too. Shipments of forgings for sale were 20 per cent greater in tonnage in the first half of this year than in the corresponding period of last year. Shipments in the first half of this year totaled 877,906 tons, compared with 732,043 tons in the first half of last year, the U. S. Department of Commerce reports.

Unfilled orders for commercial steel forgings were climbing, too. At the end of June, 1955, they totaled 519,579 tons, a 27 per cent rise over the 409,194 tons at the end of June, 1954.

Plates . .

Plate Prices, Page 266

"Getting plates in the fourth quarter is like getting gold out of Ft. Knox," said a purchasing agent for a large Pittsburgh construction firm last week.

Supply is tighter than at any time this year, with railroads and other large consumers, such as pipe fabricators, raising their fourth quarter requirements. Consumers that had not fully anticipated their needs earlier in the year are most severely pinched.

One eastern mill has opened its books for first quarter tonnage. It may be joined shortly by another. Still other mills, however, are holding off until they can better gage their position. Right now it looks like only one or two mills will enter the new year current with shipments.

All plate mills entered the current quarter behind on commitments. In an effort to become current, some have been rejecting tonnage offered. One maker, for example, still hasn't accepted December shipment tonnage. Only recently it took November delivery orders, which it was confident it could satisfy. Another producer has been having mechanical difficulties since July and has moved cautiously ever since in booking tonnage. Consequently, it may be in better position than other makers to take first quarter orders when it is able to resume full production.

The stringency in supply is heaviest in wide and heavier gages of sheared material. Most fabricators, for instance, are not too badly off for narrow universal stock. Clad plate deliveries extend to nine weeks in the case of some producers in the East.

Current inquiry reflects particularly heavy construction, oil and gas

quirements, a further gain in ma-
inery and heavy industrial equip-
ent. Jobbers are unable to keep
ocks in balance and are pressing
e mills for deliveries. Some say
ey would be satisfied if they could
ly get the tonnage promised them.
Shipment in January is promised
but one mill on a small part of
vy requirements recently closed.
tter than 6000 tons of hull plates
e involved. The best delivery oth-
makers offer is February through
ril, with the bulk of tonnage listed
March shipment.
The Standard Oil Co. which had 70
rage tanks destroyed by fire at
Whiting, Ind., refinery last Aug.
has completed plans to build a
w field of 20 tanks as partial re-
cements. Steel plate requirements
ll approximate 4000 tons. Addi-
nal plate tonnage will be needed
a new ultraforming unit, original-
projected for 1957 but pushed for-
rd on account of the fire, and
placement of a recently completed
droformer ruined by the blaze.

heets, Strip . . .

Sheet & Strip Prices, Pages 267 & 268

'Soon." That's sheetmakers' an-
er to consumers' inquiries as to
en they will open first quarter
oks. One midwest mill indicates
is about ready to accept tonnage
that delivery period; several oth-
are expected to resume active
oking within the week.
The general expectation is that
st makers will have taken action
the middle of this month. How-
r, indications are most sellers will
k largely on a month-to-month
sis, rather than open books for
entire quarter. By this policy
y can keep closer check on com-
tments. Most mills will enter first
arter with at least three-week ar-
rages. January production is al-
dy earmarked.
A producer of cold-rolled sheets
nts out that January lead time
l be Nov. 15, and says it will be
hly important for consumers to
their orders in as soon as pos-
le, well before mid-November.
On certain specialties, particularly
ctrical sheets and enameling stock,
st quarter entries have already
n made by some mills. One mak-
had long since booked through
st quarter on stainless steel sheets
d strip. This, however, is excep-
hal.
Now that production of new model
tomobiles is getting into full swing,
mand for cold-rolled sheets in the
dwest is increasingly pressing even
ugh car builders improved their

ventory position the last two nths or so. Wide hot-rolled sheets e in almost as tight supply as ld rolled in the area, while year- d carryovers in galvanized, enamel- g and electrical sheets will exceed month's production.

New England consumers are unable get all the sheets they want for st quarter. Estimated requirements lude some tonnage for inventory, t orders accepted by the mills bare- cover current operating schedules, w largely maintained by delinquent liveres. There is some evidence in e district that certain sheetmakers e withdrawing from active selling the area, temporarily at least.

Among the tightest of all products the Pittsburgh market is cold- led strip.

in Plate . . .

Tin Plate Prices, Page 268

Higher tin plate prices, announced August, went into effect Oct. 1. st consumers have been ordering pments in volume for some weeks beat the price increase deadline.

Last week the U. S. Steel Export , New York announced increased ces for export, the new bases be- concurrent with the changes in mestic quotations. The changes present an increase of 40 cents per e box, except for special coated nufacturing terne plate, which was anced 85 cents per base box.

teel Bars . . .

Bar Prices, Page 266

Hot-rolled carbon bar tonnage is ng offered for first quarter ship- nt. More producers are opening ir books for that period, but the eral disposition is to book ton- e on a month-to-month basis. For uary, it looks like much of that nth's production will be taken up caring for carry-over tonnage m fourth quarter. Despite re- ctions on order acceptances over ent weeks, the mills will not like- be able to get their books in bal- e by the year end.

Demand is pressing from all direc- ns, and the disposition to over- k is prevalent. Indications are ply will be tighter this quarter n earlier in the year.

New England users are placing l-drawn orders, including leaded des, for late delivery this year on s for which hot-rolled tonnage is ilable. Converters are fairly well anced on standard carbon grades, several that had been turning k delinquent hot-rolled orders are epting new tonnage sparingly for the first quarter.

In the East, carbon bars in all shapes and sizes are in heavy demand, reflecting widely diversified consuming needs.

Wire . . .

Wire Prices, Pages 268 & 269

Except for fencing and nails, demand for merchant wire products is declining moderately. But the smaller tonnage at mill level in these items is more than offset by heavier requirements for manufacturers wire. Building construction items are holding in strong demand, while highway construction products are at peak for the year.

The wire mills in New England are reported booking heavier volume for the first quarter with demand broadening, except for fine wire specialties, which are inclined to lag. Fourth quarter mill schedules on hard drawn wire are about filled.

Structural Shapes . . .

Structural Shape Prices, Page 266

Inquiry for structural steel continues lively. Although the edge may be off the market slightly because of the advancing building season, there still is a great diversity of tonnage coming out. Also, considerable picking and choosing among fabricators continues to be noted. Some of them are moving more cautiously than formerly in booking orders because of the scarcity of plain material, notably wide flange sections.

Structural contracts in August dropped to 311,453 tons from the previous month's revised total of 369,414 tons, the peak for the year. According to the American Institute of Steel Construction, August was the fourth consecutive month in which bookings exceeded 300,000 tons, and the total for the month showed an increase of 61 per cent over that in the corresponding month a year ago. Cumulative bookings for the first eight months were 37 per cent above those in the like period of 1954, amounting to 2,333,278 tons against 1,697,397 tons.

Shipments in August amounted to 266,715 tons, compared with a revised total of 219,444 in July. Total shipments for the first eight months were 1,900.814 tons, against 2,159,-453 in the like period last year, a decline of 12 per cent.

Order backlogs as of Aug. 31 totaled 1,775,625 tons, of which 1,059.898 tons were available for fabrication during the following four-month period.

(*Please turn to page* 280)

rrent Ferroalloy Quotations

MANGANESE ALLOYS

geleisen: (19-21% Mn, 1-3% Si), Carlot gross ton $86, Palmerton, Pa.; $87 Clairand Duquesne, Pa.
to 19% Mn) $84 per ton, Palmerton, Pa.; per ton, Clairton and Duquesne, Pa.

dard Ferromanganese, (Mn 74-76%, C 7% ox.) Base price per net ton $190, Clairton, uesne, Johnstown and Sheridan, Pa.; Alloy, Va.; Ashtabula, Marietta, Philo, O.; Sheff-, Ala.; Portland, Oreg., and Tacoma, h. Add or subtract $2.00 for each 1% or tion thereof of contained manganese over or under 74%, respectively.

79-81%). Lump $198 per net ton, f.o.b. conda or Great Falls, Mont. Add $2.60 for 1% above 81%; subtract $2.60 for each below 76%, fractions in proportion to est 0.1%.

-Carbon Ferromanganese, Regular Grade: 85-90%). Carload, lump, bulk, max, % C, 29.95c per lb of contained Mn, carpacked 30.7c, ton lots 31.8c, less ton Delivered. Deduct 1.5c for max 0.15% ade from above prices, 3c for max 0.30% .5c for max 0.50% C, and 6.5c for max C—max 7% Si. **Special Grade:** (Mn min, C 0.07% max, P 0.06% max). 2.05c to the above prices. Spot, add 0.25c.

ium-Carbon Ferromanganese: (Mn 80-85%, .25-1.5%, Si 1.5% max). Carload, lump, 21.85c per lb of contained Mn, packed, ad 22.9c, ton lot 24.5c, less ton 25.7c. vered. Spot, add 0.25c.

ganese Metal: 2" x D (Mn 95.5% min, Fe max, Si 1% max, C 0.2% max): Car-, lump, bulk, 45c per lb of metal; packed, 5c; ton lot 47.25c; less ton lots 49.25c. vered. Spot, add 2c.

trolytic Manganese Metal: Min carloads, 2000 lb to min carloads, 32c; 250 lb to lb 34c. Premium for hydrogen-removed l, 0.75c per lb. Prices are f.o.b. cars, xville, Tenn., freight allowed to St. Louis o any point east of Mississippi; or f.o.b. ietta, O., freight allowed.

omanganese: (Mn 65-68%). Contract, , bulk 1.50% C grade, 18-20% Si, 11.2c lb of alloy. Packed, c.l. 12.2c, ton 12.65c, ton 13.65c, f.o.b. Alloy, W. Va., Ashta-, O., Marietta, O., Sheffield, Ala., Port-, Oreg. For 2% C grade, Si 15-17.5%, de- 0.2c from above prices. For 3% C grade, .2-14.5%, deduct 0.4c from above prices. , add 0.25c.

TITANIUM ALLOYS

otitanium, Low-Carbon: (Ti 20-25%, Al max, Si 4% max, C 0.10% max). ract, ton lots 2" x D, $1.50 per lb of ained Ti; less ton $1.55. (Ti 38-43%, Al max, Si 4% max, C 0.10% max). Ton $1.35, less ton $1.37 f.o.b. Niagara Falls, Y., freight allowed to St. Louis. Spot, .5c.

otitanium, High-Carbon: (Ti 15-18%, C %). Contract $177 per ton, f.o.b. Ni-a Falls, N. Y., freight allowed to destina- east of Mississippi river and north of imore and St. Louis.

ottitanium, Medium-Carbon: (Ti 17-21%, C %). Contract $195 per ton, f.o.b. Ni-a Falls, N. Y., freight not exceeding St. s rate allowed.

CHROMIUM ALLOYS

-Carbon Ferrochrome: Contract, c.l., , bulk 26.25c per lb of contained Cr; c.l. ed 27.5c, ton lot 29.25c, less ton 30.65c. vered. Spot, add 0.25c.

-Carbon Ferrochrome: (Cr 67-71%). Con-t, carload, lump, bulk, C 0.025% max plex) 31.75c per lb contained Cr, 0.02 38.50c, 0.03 max 38c, 0.06 max 36.50c, max 36c, 0.15 max 35.75c, 0.2 max 35.50c, max 35.25c, 1.0 max 34c, 1.5 max 33.85c, max 33.75c. Ton lot, add 3.1c, less ton 4.8c. Carload packed add 1.45c. Delivered. add 0.25c.

ndry Ferrochrome, High-Carbon: (Cr 62-, C 5-7%, Si 7-10%). Contract, c.l. 8 M x bulk 27.4c per lb contained Cr. Packed 28.7c, ton 30.5c, less ton 32c. Delivered. , add 0.25c.

Foundry Ferrochrome, Low-Carbon: (Cr 50-54%, Si 28-32%, C 1.25% max). Contract, carloads, packed 8 M x D, 19.6c per lb of alloy, ton lot 20.85c; less ton lot, 22.05c, delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome-Silicon: (Cr 34-41%, Si 42-49%, C 0.05% max). Contract, carload, lump, 4" x down and 2" x down, bulk, 39.05c per lb of contained Cr; 1" x down, bulk 39.8c. Delivered.

Chromium Metal, Electrolytic: Commercial grade (Cr 99.2% min, Fe 0.2 max) Contract, carlot, packed 2" x D plate (about ⅛" thick) $1.25 per lb, ton lots $1.27, less ton lots $1.28. Delivered. Spot add 5c.

VANADIUM ALLOYS

Ferrovanadium: Open-hearth Grade (V 50-55%, Si 8% max, C 3% max). Contract, any quantity, $3.10 per lb of contained V. Delivered. Spot, add 10c. **Special Grade** (V 50-55% or 70-75%, Si 2% max, C 0.5% max) $3.20. **High Speed Grade** (V 50-55%, or 70-75%, Si 1.50% max, C 0.20% max) $3.30.

Grainal: Vanadium Grainal No. 1, $1.05 per lb; No. 6, 68c; No. 79, 50c, freight allowed.

Vanadium Oxide: Contract, less carload lots, packed, $1.33 per lb contained V_2O_5, freight allowed. Spot, add 5c.

SILICON ALLOYS

25-30% Ferrosilicon: Contract, carload, lump, bulk, 20.0c per lb of contained Si, packed 21.40c; ton lot 22.50c f.o.b. Niagara Falls, freight not exceeding St. Louis rate allowed.

50% Ferrosilicon: Contract, carload, lump, bulk, 11.75c per lb of contained Si. Packed, c.l. 13.85c, ton lot 15.3c, less ton 16.95c. F.o.b. Alloy, W. Va., Ashtabula, O., Marietta, O., Sheffield, Ala., and Portland, Oreg.. Spot, add 0.45c.

Low-Aluminum 50% Ferrosilicon: (Al 0.40% max). Add 1.2c to 50% ferrosilicon prices.

65% Ferrosilicon: Contract, carload, lump, bulk, 14.5c per pound contained silicon. Packed, c.l. 16.2c, ton lots, 18c; less ton, 19.35c. Delivered. Spot, add 0.35c.

75% Ferrosilicon: Contract, carload, lump, bulk, 15.4c per lb of contained Si. Packed c.l. 17.05c, ton lot 18.7c, less ton 19.95c. Delivered. Spot, add 0.3c.

90% Ferrosilicon: Contract, carload, lump, bulk, 18.5c per lb of contained Si. Packed, c.l. 19.95c, ton lot 21.35c, less ton 22.4c. Delivered. Spot, add 0.25c.

Silicon Metal: (Mn 98% Si, 0.75% max Fe, 0.07 max Ca). C.l. lump, bulk, 20.5c per lb of Si. Packed, c.l. 21.95c, ton lot 23.25c, less ton 24.25c. Add 0.5c for max 0.03 Ca grade. Deduct 0.5c for max 2% Fe grade analyzing min 96.5% Si. Spot, add 0.25c.

Alsifer: (Approx, 20% Al, 40% Si, 40% Fe). Contract, basis f.o.b. Niagara Falls, N. Y., lump, carload, bulk, 10.65c per lb of alloy, ton lots packed 11.8c.

ZIRCONIUM ALLOYS

12-15% Zirconium Alloy: (Zr 12-15%, Si 39-43%, C 0.20% max). Contract, c.l. lump, bulk 8.5c, per lb of alloy. Packed, c.l. 9.5c, ton lot 10.65c, less ton 11.5c. Delivered. Spot, add 0.25c.

35-40% Zirconium Alloy: (Zr 35-40%, Si 47-52%, Fe 8-12%, C 0.50% max). Contract, carload, lump, packed 26.25c per lb of alloy, ton lot 27.4c, less ton 28.65c. Freight allowed. Spot, add 0.25c.

BORON ALLOYS

Ferroboron: (B 17.50% min, Si 1.50% max, Al 0.50% max, C 0.50% max). Contract, 100 lb or more 1" x D, $1.20 per lb of alloy. Less than 100 lb $1.30. Delivered, spot add 5c. F.o.b. Washington, Pa., prices, 100 lb and over, are as follows: Grade A (10-14% B) 85c per pound; Grade B (14-18% B) $1.20; Grade C (19% min B) $1.50.

Borosil: (3 to 4% B, 40 to 45% Si). $5.25 per lb contained B, delivered to destination.

Bortam: (B 1.5%-1.9%). Ton lots, 45c per lb; smaller lots, 50c per lb.

Carbortam: (B 1 to 2%). Contract, lump, carloads 9.50c per lb f.o.b. Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

CALCIUM ALLOYS

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%). Contract, carload, lump, bulk 22c per lb of alloy, carload packed 23.05c, ton lot 24.95c, less ton 25.95c. Delivered. Spot, add 0.25c.

Calcium-Silicon: (Ca 30-33%, Si 60-65%, Fe 1.5-3%). Contract, carload, lump, bulk 21.5c per lb of alloy, carload packed 22.95c, ton lot 25.25c, less ton 26.75c. Deld. Spot, add 0.25c.

BRIQUETTED ALLOYS

Chromium Briquets: (Weighing approx. 3⅝ lb each and containing exactly 2 lb of Cr). Contract, carload, bulk, 16.95c per lb of briquet, carload packed in box pallets 17.15, in bags 17.85c; 3000 lb to c.l. in box pallets 18.35c; 2000 lb to c.l. in bags, 19.05c; less than 2000 lb in bags 19.95c. Deld. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx. 3 lb and containing exactly 2 lb of Mn). Contract, carload, bulk 12.1c per lb of briquet, c.l. packed, pallets 12.3c, bags 13.1c; 3000 lb to c.l., pallets, 13.5c; 2000 lb to c.l., bags, 14.3c, less ton 15.2c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicomanganese Briquets: (Weighing approx. 3½ lb and containing exactly 2 lb of Mn and approx. ½ lb of Si). Contract, c.l. bulk 12.7c per lb of briquet, c.l. packed, pallets, 12.9c; bags 13.7c, 3000 lb to c.l., pallets, 14.1c; 2000 lb to c.l., bags, 14.9c; less ton 15.8c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx. 5 lb and containing exactly 2 lb of Si). Contract, carload, bulk 6.75c per lb of briquet; packed, pallets, 6.95c; bags, 7.75c; 3000 lb to c.l., pallet, 8.55c; 2000 lb to c.l. bags 9.35c; less ton 10.25c. Delivered. Spot, add 0.25c.

(Small size—Weighing approx. 2½ lb and containing exactly 1 lb of Si). Carload, bulk 6.9c. Packed, pallets 7.1c; bags 7.9c; 3000 lb to c.l. pallets 8.7c; 2000 to c.l. bags 9.5c; less ton 10.4c. Delivered. Add 0.25c for notching, small size only. Spot, add 0.25c.

Molybdic-Oxide Briquets: (Containing 2½ lb of Mo each) $1.14 per pound of Mo contained, f.o.b. Langeloth, Pa.

TUNGSTEN ALLOYS

Ferrotungsten: (70-80%), 5000 lb W or more $3.45 per lb of contained W; 2000 lb W to 5000 lb W, $3.55; less than 2000 lb W, $3.67, delivered.

OTHER FERROALLOYS

Ferrocolumbium: (Cb 56-60%, Si 8% max, C 0.4% max). Contract, ton lot, 2" x D, $6.80-$6.90 per lb of contained Cb. Delivered. Spot, add 10c.

Ferrotantalum—Columbium: (Cb 40% approx., Ta 20% approx., and Cb plus Ta 60% min C 0.30% max). Ton lots, 2" x D, $4.65 per lb of contained Cb plus Ta, deld.; less ton lots $4.70.

Silicaz Alloy: (Si 35-40%, Ca 9-11%, Al 6-8%, Zr 3-5%, Ti 9-11%, B 0.55-0.75%). Carloads packed 1" x D, 45c per lb of alloy, ton lot 47c, less ton 49c. Delivered.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7%, Fe 20% approx.). Contract, c.l. packed, ½" x 12 M, 18.5c per lb of alloy, ton lots 19.65c, less ton 20.9c. Deld. Spot, add 0.25c.

Graphidox No. 5: (Si 48-52%, Ca 5-7%, Ti 9-11%). C.l. packed, 18.5c per lb of alloy, ton lots 19.65c; less ton lots 20.9c, f.o.b. Niagara Falls, N. Y.; freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19%, Mn 8-11%). C.l. packed 17.2c per lb of alloy; ton lots 18.7c; less ton lots 19.95c, f.o.b. Niagara Falls; freight allowed to St. Louis.

Siminal: (Approx. 20% each Si, Mn, Al; bal, Fe). Lump, carload, bulk 16.50c. Packed c.l. 17.50c, 2000 lb to c.l. 18.50c, less than 2000 lb 19c per lb of alloy. Delivered.

Ferrophosphorus: (23-25% based on 24% P content with unitage of $4 for each 1% of P above or below the base); carloads, f.o.b. sellers' works. Mt. Pleasant, Siglo, Tenn. $90 per gross ton.

Ferromolybdenum: (55-75%). Per lb contained Mo, in 200-lb containers, f.o.b. Langeloth, Pa., $1.46 in all sizes except powdered which is $1.57; Washington, Pa., furnace, any quantity $1.46.

Technical Molybdic-Oxide: Per lb contained Mo, f.o.b. Langeloth, Pa., $1.25 in cans; in bags, $1.24, f.o.b. Langeloth, Pa.; Washington, Pa. $1.24.

(*Concluded from page 277*)

Reports are heard of construction projects being slowed down by the scarcity of steel.

In New England fabricators' deliveries are being set back by the shortage of steel. Prices on structural steel in place in the area are firmer even though a slight seasonal decline in estimating is in evidence. Area bridge tonnage is heavier, including 7500 tons for Connecticut highways, in addition to 4600 tons on which bids have been taken.

West Coast fabricators report increasing scarcity of wide flange sections and plates.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

3500 tons, grade crossing elimination, Boston & Maine railroad, state project, Salem, Mass., to Groisser & Shlager Iron Works, Somerville, Mass.; Farina Bros., Watertown, Mass., general contractor.

350 tons, potline building, Kaiser Aluminum & Chemical Co., Tacoma, Wash., to Bethlehem Pacific Coast Steel Corp., Seattle.

305 tons, state highway bridges, Plymouth, Mass., to American Bridge Division, U. S. Steel Corp., Pittsburgh; Central Construction Co., Lawrence, Mass., general contractor.

150 tons, 230-kv transmission line for Atomic Energy Commission, Richland, Wash.; reported to American Bridge Division, U. S. Steel Corp., Pittsburgh.

STRUCTURAL STEEL PENDING

7500 tons, superstructure, bridge, Housatonic river, Stratford-Milford, Conn.; bids Oct. 31 at Hartford, Conn.

4165 tons, Weyerhaeuser Lumber Co., pulp mill. Cosmopolis, Wash.

2325 tons, overpass structures, Greenwich-Killingly expressway, Milford, Conn.; DeFalice Co., New Haven, Conn., is low.

2304 tons, superstructure, bridge, Norwalk river, Greenwich-Killingly expressway, Norwalk, Conn.; Klevins Corp., Yonkers, N. Y., is low.

1445 tons, contract P-147, power house addition, Kent Ave., Brooklyn, N. Y., New York City Board of Transportation; Lehigh Structural Steel Co., Allentown, Pa., is low bidder.

1180 tons, power plant addition, 75th St., New York, New York City Board of Transportation; Lehigh Structural Steel Co., Allentown, Pa., is low bidder.

225 tons, substructure, bridge, Norwalk river, and grade separation, Norwalk, Conn.; Mariani Construction Co., New Haven, Conn., is low.

205 tons, bridge, Tolland, Conn.; D. Arrigoni Co., New Haven, Conn., is low.

REINFORCING BARS . . .

REINFORCING BARS PLACED

480 tons, including 65 tons long span joists, for women's dormitory, University of Vermont, Burlington, Vt., to Vermont Structural Steel Co., Burlington; H. P. Cummings Construction Co., Ware, Mass., general contractor.

350 tons, apartment, Rittenhouse Square, Philadelphia, to American Steel Engineering Co., Philadelphia.

131 tons, two state highway jobs (Washington), Thurston and Yakima counties, to Soule Steel Co., Seattle.

180 tons, Thirtieth St. parking area, Pennsylvania Railroad, Philadelphia, to American Steel Engineering Co., that city.

111 tons, two Washington state highway projects, Grays Harbor county, to Bethlehem Pacific Coast Steel Corp., Seattle; Manson Construction Co. and Leavitt & Chandler, Seattle, general contractors.

70 tons, two Washington state highway ects, King and Thurston counties, to N west Steel Rolling Mills Inc., Seattle Fiorito Co., Seattle, general contractor.

REINFORCING BARS PENDING

535 tons, Washington state Capitol bridge, Thurston county; bids to Oly Wash., Oct. 18.

448 tons, state bridge work, contract 1, C county, N. J.; bids Oct. 18.

100 tons, or more, Idaho state under Latah county; general contract to W G. Meyers & Sons, Spokane, Wash., $56,672.

100 tons, or more, Idaho state Payette bridge; J. H. Wise & Son, Boise, I low at $40,416.

PLATES . . .

PLATES PENDING

950 tons, three storage tanks, King Sal Alaska, base; Macri Construction Seattle, is low at $1,001,043 to U. S. gineer.

PIPE . . .

CAST IRON PIPE PENDING

100 tons, 9675 feet of 6 in.; bids to M teo, Wash., Oct. 11.

STEEL PIPE PLACED

Unstated, 13,500 feet of 6⅝-in. outside d eter, to Beall Pipe & Tank Co., Portl Oreg., by Portland Gas & Coke Co. natural gas distribution.

RAILS, CARS . . .

RAILROAD CARS PLACED

Boston & Maine, one lightweight train American Car & Foundry Division, A Industries Inc., New York.

Delaware, Lackawanna & Western, 50 h way trailers for its trailer-on-flatcar gyback service, to unstated builder.

lres

Lake Superior Iron Ore

rices effective for the 1955 shipping season, oss ton, 51.50% iron natural, rail of vessel, ver lake ports)

d range bessemer $10.40
d range nonbessemer 10.25
sabi bessemer 10.25
sabi nonbessemer 10.10
en-hearth lump 11.25
gh phosphorus 10.00

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

undry and basic 52-62% concentrates
contract 17.00-18.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

redish basic, 60-68% 20.00
African hematite (spot)...nom. 18.00-20.00
azilian iron ore, 68-69% (spot)..24.00-26.00

Tungsten Ore

Net ton unit, before duty

reign, wolframite, good commercial quality .....*$34.50-$35.00*
mestic, scheelite, mine 63.00

Manganese Ore

48%, nearby, 95c-$1.05 per long ton unit, .f. U. S. ports, duty for buyer's account; 47%, 75c-80c.

Chrome Ore

oss ton, f.o.b. cars New York, Philadel-la, Baltimore, Charleston, S. C., plus ocean ight differential for delivery to Portland, eg., Tacoma, Wash.

Indian and African

% 2.8:1 .....nom. $45.00-$50.00
% 3:1 ..... 42.00-44.00
% no ratio 34.00

South African Transvaal

% no ratio .....$19.00-$20.00
% no ratio 32.00

Domestic

Rail nearest seller

% 3:1 .....$39.00

Molybdenum

iphide concentrate, per lb of Mo con-ent, mines, unpacked $1.00

Antimony Ore

Per unit of Sb content, c.i.f. seaboard

60% .....*$3.60-$3.85*
65% *3.85-4.00*

Vanadium Ore

Cents per lb V_2O_5 content, deld. mills
mestic 31.00

efractories

Fire Clay Brick (per 1000)

gh-Heat Duty: Ashland, Grahn, Hayward, tchins, Haldeman, Olive Hill, Ky., Athens, oup, Tex., Beech Creek, Clearfield, Curwens-le, Lock Haven, Lumber, Orviston, West catur, Pa., Bessemer, Ala., Farber, Mexico, Louis, Vandalia, Mo., Ironton, Oak Hill, rral, Portsmouth, O., Ottawa, Ill., Stevens ttery, Ga., $122; Salina, Pa., $127; Niles, $133.

per-Duty: St. Louis, $150.

Silica Brick (per 1000)

ndard: Alexandria, Claysburg, Mt. Union, roul, Pa., Ensley, Ala., Portsmouth, O., wston, Pa., $128; Warren, Niles, O., Hays, ., $133; Morrisville, Pa., $131.50; E. Chi-go, Ind., Joliet, Rockdale, Ill., $138; Lehigh, ah, $144; Los Angeles, $151.

per Duty: Hays, Sproul, Hawston, Pa., arren, Windham, O., Athens, Tex., $145; rrisville, Pa., Niles, O., $148; Joliet, Ill., 51; Curtner, Calif., $163.

Semisilica Brick (per 1000)

earfield, Pa., $139; Philadelphia, $125; Wood-dge, N. J., $122.

Insulating Fire Brick (per 1000)

00° *F:* Massillon, O., $178.50; Clearfield, ., $213; Augusta, Ga., Beaver Falls, Zeli-ople, Pa., Mexico, Mo., $206; Vandalia, Mo., 14.10; Portsmouth, O., $207.50; Bessemer, a., $212.80.

Ladle Brick (per 1000)

y Pressed: Alsey, Ill., Chester, New Cumber-nd, W. Va., Freeport, Johnstown, Merrill ation, Pa., Mexico, Mo., $88.50; Wellsville, $92.50; Clearfield, Pa., Portsmouth, O., 8.

High-Alumina Brick (per 1000)

Per Cent: Clearfield, Pa., St. Louis, Mexi-, Mo., $194; Danville, Ill., $197.

Per Cent: St. Louis, Mexico, Vandalia, Mo., earfield, Pa., $241; Danville, Ill., $244.

Per Cent: St. Louis, Mexico, Vandalia, Mo., 79; Danville, Ill., $281; Clearfield, Pa., $286.

Sleeves (per 1000)

esdale, Johnstown, Bridgeburg, Pa., $157; earfield, Pa., $158.50; St. Louis, $169.30.

Nozzles (per 1000)

esdale, Pa., $253.70; Johnstown, Pa., 59.20; Clearfield, Pa., $259.40; St. Louis, 59.45; Bridgeburg, Pa., $286.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $196; Clearfield, Pa., $198; St. Louis, $195.80.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, O., Gibsonburg, Narlo, O., $15; Thornton, McCook, Ill., $15.60; Dolly Siding, Bonne Terre, Mo., $14.

Magnesite (per net ton)

Domestic, dead-burned, bulk, ½-in. grains with fines: Chewelah, Wash., $40; Luning, Nev., $40. ⅝-in. grains with fines: Baltimore, $66.40.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, furnace .....$13.25-$14.00
Connellsville, foundry 16.00-17.00

Oven Foundry Coke

Kearny, N. J., ovens $25.50
Camden, N. J., ovens 25.00
Everett, Mass., ovens
New England, deld. *27.05
Chicago, ovens 25.75
Chicago, deld. 27.25
Terre Haute, Ind., ovens 25.50
Milwaukee, ovens 26.25
Indianapolis, ovens 25.50
Portsmouth, O., ovens 24.75
Cincinnati, deld. 27.34
Painesville, O., ovens 26.25
Cleveland, deld. 28.18
Erie, Pa., ovens 25.00
Birmingham, ovens 22.65
Cincinnati, deld. 27.58
Buffalo, ovens 25.75
Buffalo, deld. 27.00
Lone Star, Tex., ovens 19.50
Neville Island, Pa., ovens 25.00
Philadelphia, ovens 25.00
Swedeland, Pa., ovens 25.00
St. Louis, ovens
St. Louis, deld. 26.00
St. Paul, ovens 25.00
Detroit, ovens 26.25
Detroit, deld. 27.25
Pontiac, deld. 27.81
Saginaw, deld. 29.33

*Or within $4.55 freight zone from works.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzol 36.00
Toluol, one deg. 32.00-35.00
Industrial xylol 32.00-35.00

Per ton, bulk, ovens

Ammonium sulphate .....$42-$45
Birmingham area .....42.00†

†With port equalization against imports.

Cents per pound, producing point

Phenol: Grade 1, 14.00; Grade 2-3, 13.50; Grade 4, 15.50; Grade 5, 14.25.

Fluorspar

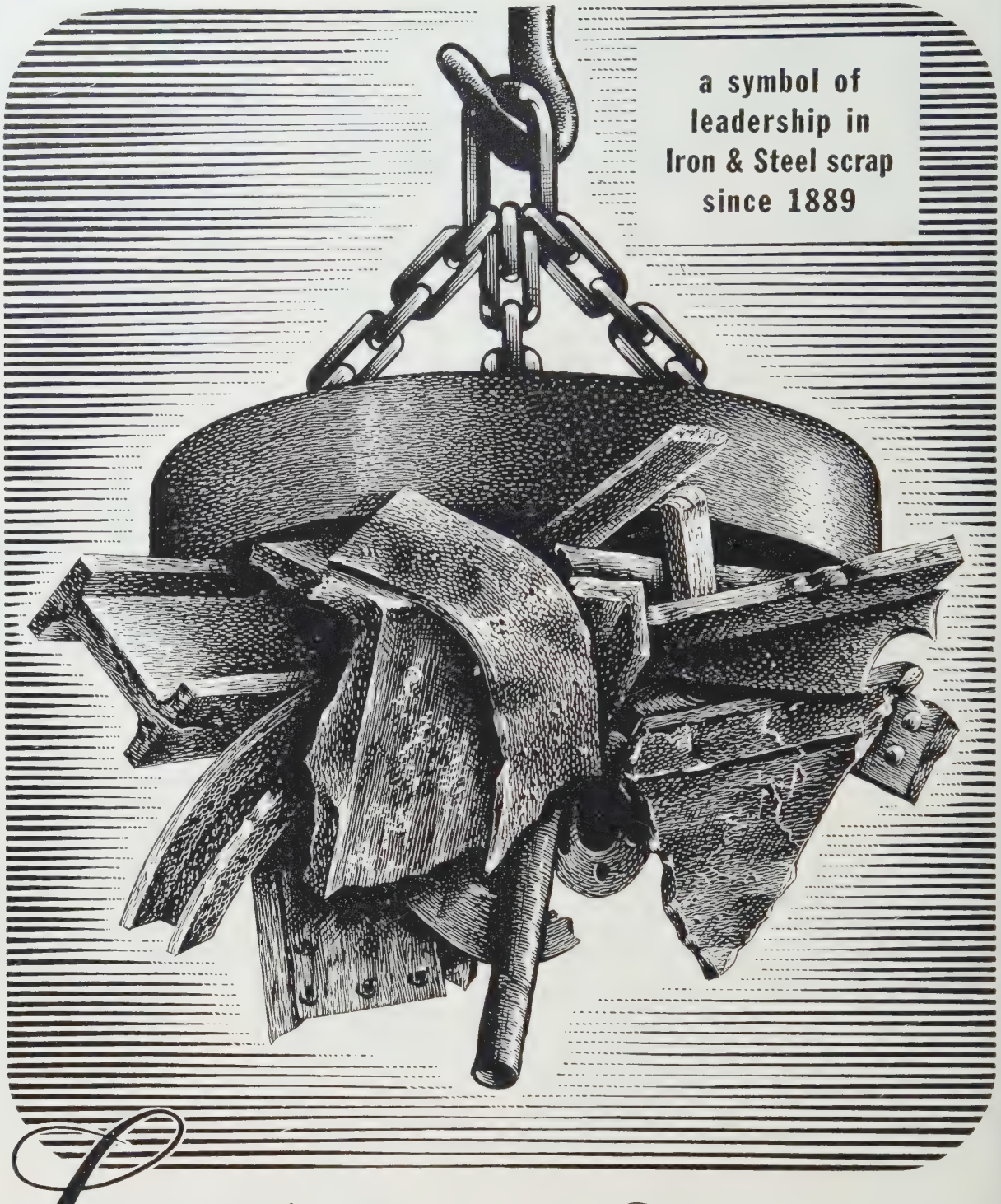
Metallurgical grades, f.o.b. shipping point, in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $38-$39; 70%, $35-$36; 60%, $31-$32. Imported, net tons, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $34; Mexican, $25.50.

Electrodes

Threaded with nipple, unboxed. f.o.b. plant

GRAPHITE

Inches		Per
Diam	Length	100 lb
2	24	$52.50
2½	30	33.75
3	40	32.00
4	40	30.25
5⅛	40	30.00
6	60	27.25
7	60	26.75
8, 9, 10	60	24.25
12	72	27.25
14	60	23.50
16	72	22.50
17	60	23.00
18	72	22.50
20	72	22.25
	CARBON	
8	60	12.10
10	60	11.80
12	60	11.75
14	60	11.70
14	72	10.85
17	60	10.75
17	72	10.35
20	84	10.30
20	90	10.10
24	72, 84	10.30
24	96	10.05
30	84	10.20
40, 35	110	9.90
40	100	9.90



Luria Brothers and Company, Inc

MAIN OFFICE

LINCOLN-LIBERTY BLDG.

Philadelphia 7, Penna.

PLANTS

LEBANON, PENNA.
READING, PENNA.
MODENA, PENNA.
DETROIT (ECORSE), MICHIGAN
PITTSBURGH, PENNA.
ERIE, PENNA.

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SEATTLE, WASH.
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PUEBLO, COLORAD
READING, PENNA
ST. LOUIS, M
SAN FRANCISCO, CA

EXPORTS-IMPORTS—LIVINGSTON & SOUTHARD, INC. 99 Park Ave., New York, N. Y. *Cable Address:* FORENTRAC

ɔcrap . . .

Scrap Prices, Page 284

Pittsburgh — Two mill purchases ırly this month put life in a dull arket. A mill on the fringe of the strict made a "normal-sized" purıase of No. 1 heavy melting scrap : $45 and No. 2 heavy melting at 0 to $41 a ton. A mill nearer Pittsırgh bought No. 2 heavy melting rap at $41 and No. 2 bundles at 8 a ton. There's some disagreeent as to the strength of No. 2 ndles, with prices $2 a ton lower ing rumored.

Despite this increase in the scrap ovement, sales of scrap are consided low in view of predicted high urth quarter steelmaking operaıns and heavy scrap movement in me other districts. Brokers conıue to report a "strong undertone" the market.

Boston — Steel scrap prices are ghtly higher, including borings d turnings, based on buying by trict and eastern Pennsylvania asumers. Shipments are more ac-e from yards, with supplies ample meet current demands. Cast scrap moving slowly at unchanged ces.

New York — With broker buying ghtly more active against orders consumers, steel scrap prices are changed. Yard suppliers are movg greater volume; stocks balance mand. No. 1 cupola cast is up 50, with brokers paying $36.

Philadelphia—Scrap prices are genlly unchanged. The only revision ed is an advance on No. 1 cupola $40-$42, delivered. This reflects ıtinued drain on supplies by conners outside the district, particuly Virginia. The two leading pipe ls in this area are paying $42, ivered, with one paying as high $43 for cupola cast from New gland. The Florence, N. J., pipe p, which is curtailing operations s month while making plant imvements, will continue to take in ap as usual.

Buffalo—Substantial purchases of elmaking scrap at established es by a leading district mill conıer has served to sustain strength the market. Cast grades also are ong.

Cincinnati—Prices on scrap rails ved up $1 to $2 a ton on strong nand from rerollers. One-foot plate breakable cast also advanced. e other grades are holding steady the absence of local buying. Brokare of the opinion that the marmay do a lot of jumping once ers are placed, making it difficult for them to cover contracts.

Detroit—Scrap prices are relatively on a par with those prevailing here a month ago. The mills are paying the same, and auto lists are about the same.

Chicago—A small purchase of No. 2 bundles at $34 a gross ton, up $2 over the price which had prevailed for several weeks, was reported last week. This sale serves as a mild shot-in-the-arm for material of dealer origin. Until now, advances in industrial grades of up to $4 a ton had failed to sharpen interest of consumers in dealer offerings. How to interpret the latest purchase is a question. The smallness of the order could indicate that the buyer seeks minimum stimulation of the market, or that sellers are unwilling to commit themselves for bigger volume at the new price.

Cleveland — The price on No. 1 heavy melting steel is up about $1 a ton in this market as a result of substantial sales in the Valley the last week or so. Two large mills in that district bought tonnage, paying up to $48.50. In general, the market displays strength, with steelmaking operations holding at boom pace. Low phos material is quoted up here as result of a purchase by one large foundry.

St. Louis—Mills are about ready to re-enter the scrap market. Their stockpiles have dwindled owing to small receipts and continued high operations. They have raised their bid prices on No. 1 and No. 2 heavy melting steel and bundles to equalize with Chicago and Kansas City offerings.

Birmingham — Steel scrap prices are unchanged here, but an Atlanta, Ga. mill increased its price for No. 2 heavy melting steel $1, offering $36 for shipments on nearby tonnage with a premium of $5 for scrap originating in areas where freight to Atlanta is $4.01 and up.

Los Angeles—The scrap market is firm here. No. 2 bundles have been advanced $2 a ton to $27. No. 1 cupola cast has steadied at $42 after fluctuating for several months.

San Francisco—Scrap prices are unchanged here at $34 for No. 1 steel, but traders anticipate an early rise. Exporters are paying up to $37 for top grades.

Seattle—The scrap market is firm. No. 1 is quoted at $39.50; No. 2 heavy melting at $35.50. These prices are the highest in recent years and reflect increased local consumption and an active export movement.

(*Please turn to page* 286)

Iron and Steel Scrap

Consumer prices, per gross ton, except as otherwise noted, including broker's commission, as reported STEEL. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Oct. 5	$45.33
Sept. 28	45.00
Sept. Avg.	44.42
Oct. 1954	32.25
Oct. 1950	41.37

Based on No. 1 heavy melting grade at Pittsburgh, Chicago and eastern Pennsylvania.

PITTSBURGH

(Delivered consumer's plant)

No. 1 heavy melting	*44.00-45.00*
No. 2 heavy melting	*40.00-41.00*
No. 1 bundles	*44.00-45.00*
No. 2 bundles	*37.00-38.00*
No. 1 busheling	*44.00-45.00*
Machine shop turnings	29.00-30.00
Mixed borings, turnings	29.00-30.00
Short shovel turnings	32.00-33.00
Cast iron borings	32.00-33.00
Cut structurals, 3 ft lengths	49.00-50.00
Heavy turnings	42.00-43.00
Punchings & plate scrap	49.00-50.00
Electric furnace bundles	48.00-49.00

Cast Iron Grades

No. 1 cupola	42.00-43.00
Charging box cast	38.00-39.00
Heavy breakable cast	38.00-39.00
Unstripped motor blocks	29.00-30.00
No. 1 machinery cast	46.00-47.00

Railroad Scrap

No. 1 R.R. heavy melt.	47.00-48.00
Rails, 2 ft and under	54.00-55.00
Rails, 18 in. and under	55.00-56.00
Rails, random lengths	51.00-52.00
Railroad specialties	53.00-54.00

Stainless Steel Scrap

18-8 bundles & solids	270.00-285.00
18-8 turnings	130.00-140.00
430 bundles & solids	100.00-110.00
430 turnings	60.00-65.00

CLEVELAND

(Delivered consumer's plant)

No. 1 heavy melting	*44.00-45.00*
No. 2 heavy melting	32.00-33.00
No. 1 bundles	*44.00-45.00*
No. 2 bundles	29.00-30.00
No. 1 busheling	*44.00-45.00*
Machine shop turnings	23.00-24.00
Mixed borings, turnings	27.50-28.50
Short shovel turnings	27.50-28.50
Cast iron borings	27.50-28.50
Low phos.	45.00-46.00
Cut structural plates 2 ft and under	*49.00-50.00*
Alloy free, short shovel turnings	31.00-32.00
Electric furnace bundles	*44.00-45.00*

Cast Iron Grades

No. 1 cupola	47.00-48.00
Charging box cast	40.00-41.00
Stove plate	46.00-47.00
Heavy breakable cast	37.00-38.00
Unstripped motor blocks	29.00-30.00
Brake shoes	35.00-36.00
Clean auto cast	48.00-49.00
Burnt cast	37.00-38.00
Drop broken machinery	49.00-50.00

Railroad Scrap

No. 1 R.R. heavy melt.	45.00-46.00
R.R. malleable	51.00-52.00
Rails, 2 ft and under	*57.00-58.00*
Rails, 18 in. and under	*58.00-59.00*
Rails, random lengths	50.00-51.00
Cast steel	46.00-47.00
Railroad specialties	52.00-53.00
Uncut tires	47.00-48.00
Angles, splice bars	53.50-54.50
Rails, rerolling	60.00-61.00

Stainless Steel

(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	*290.00-300.00*
18-8 turnings	130.00-140.00
430 clips, bundles, solids	90.00-100.00
430 turnings	40.00-50.00

YOUNGSTOWN

(Delivered consumer's plant)

No. 1 heavy melting	*47.50-48.50*
No. 2 heavy melting	35.00-36.00
No. 1 bundles	*47.50-48.50*
No. 2 bundles	32.00-33.00
No. 1 busheling	*47.50-48.50*
Machine shop turnings	24.00-25.00
Short shovel turnings	29.00-30.00
Cast iron borings	29.00-30.00
Low phos.	*47.50-48.50*
Electric furnace bundles	*47.50-48.50*

Railroad Scrap

No. 1 R.R. heavy melt.	*48.00-49.00*

CHICAGO

No. 1 heavy melting	44.00-46.00
No. 2 heavy melting	36.00-37.00
No. 1 factory bundles	46.00-47.00
No. 1 dealer bundles	43.00-44.00
No. 2 bundles	*33.00-34.00*
No. 1 busheling	44.00-46.00
Machine shop turnings	29.00-30.00
Mixed borings, turnings	29.00-30.00
Short shovel turnings	31.00-32.00
Cast iron borings	31.00-32.00
Cut structurals, 3 ft	47.00-48.00
Punchings & plate scrap	48.00-49.00

Cast Iron Grades

No. 1 cupola	48.00-49.00
Stove plate	37.00-38.00
Unstripped motor blocks	34.00-35.00
Clean auto cast	*53.00-54.00*
Drop broken machinery	*53.00-54.00*

Railroad Scrap

No. 1 R.R. heavy melt.	47.00-48.00
R.R. malleable	54.00-55.00
Rails, 2 ft and under	59.00-60.00
Rails, 18 in. and under	60.00-61.00
Angles, splice bars	56.00-57.00
Rails, rerolling	65.00-66.00

Stainless Steel Scrap

18-8 bundles & solids	290.00-300.00
18-8 turnings	160.00-170.00
430 bundles & solids	100.00-105.00
430 turnings	45.00-50.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	40.00
No. 2 heavy melting	30.00
No. 1 bundles	40.00
No. 2 bundles	29.00
No. 1 busheling	40.00
Machine shop turnings	22.50
Mixed borings, turnings	22.50
Short shovel turnings	25.50
Punchings & plate scrap	*46.50*

Cast Iron Grades

Charging box cast	32.00
No. 1 cupola	39.00
Stove plate	32.00
Heavy breakable	32.00
Unstripped motor blocks	22.00
Clean auto cast	*44.00*
Malleable	35.00

BIRMINGHAM

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	32.00-33.00
No. 1 bundles	36.00-37.00
No. 2 bundles	28.00-29.00
No. 1 busheling	36.00-37.00
Cast iron borings	17.00-18.00
Short shovel turnings	26.00-27.00
Machine shop turnings	*25.00-26.00*
Electric furnace bundles	*38.00-39.00*

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	47.50-48.00
Stove plate	44.50-45.50
Rails, rerolling	*56.00-57.00*
Rails, random lengths	*51.00-52.00*
Unstripped motor blocks	36.00-37.00
Charging box cast	28.00-29.00
No. 1 wheels	38.00-39.00

Railroad Scrap

Bar crops and plate	*43.00-44.00*
Structural plate, 2 ft	*42.00-43.00*
Rails, 18-in. and under	*57.00-58.00*
No. 1 R.R. heavy melt.	42.00-43.00
Angles, splice bars	50.00-51.00

PHILADELPHIA

(Delivered consumer's plant)

No. 1 heavy melting	46.00-47.00
No. 2 heavy melting	40.00-41.00
No. 1 bundles	46.00-47.00
No. 2 bundles	37.00-39.00
No. 1 busheling	46.00-47.00
Electric furnace bundles	47.50
Machine shop turnings	28.00-28.50
Mixed borings, turnings	27.00-28.00
Short shovel turnings	30.50-31.00
Structurals & plate	49.00-50.00
Heavy turnings	42.00
Couplers, springs, wheels	51.00
Rail crops, 2 ft & under	58.00

Cast Iron Grades

No. 1 cupola	*40.00-42.00*
Malleable	58.00
Heavy breakable cast	45.00-46.00
Drop broken machinery	47.00-48.00

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	41.00-42.00
No. 2 heavy melting	37.00-38.00
No. 1 bundles	40.50-41.50
No. 2 bundles	32.00-33.00
Machine shop turnings	20.00-21.00
Mixed borings, turnings	21.00-22.00
Short shovel turnings	22.00-23.00
Low phos. (structural & plate)	42.00-43.00

Cast Iron Grades

No. 1 cupola	*36.00*
Unstripped motor blocks	25.00-26.00
Heavy breakable	38.00-39.00

Stainless Steel

18-8 borings, turnings	150.00-160.00
430 sheets, clips, solids	115.00-120.00
410 sheets, clips, solids	100.00-105.00
18-8 sheets, clips, solids	280.00-285.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*36.50-37.50*
No. 2 heavy melting	*31.00-31.50*
No. 1 bundles	*36.50-37.50*
No. 2 bundles	*27.00-27.50*
Machine shop turnings	18.50-19.00
Mixed borings, turnings	*22.50-23.00*
Short shovel turnings	*23.50-24.00*
No. 1 cast	30.00-31.00
Mixed cupola cast	28.00-29.00
No. 1 machinery cast	35.00-36.00

BUFFALO

No. 1 heavy melting	38.00-39.00
No. 2 heavy melting	35.00-36.00
No. 1 bundles	38.00-39.00
No. 2 bundles	32.00-33.00
No. 1 busheling	38.00-39.00
Mixed borings, turnings	28.00-29.00
Machine shop turnings	26.00-27.00
Short shovel turnings	29.00-30.00
Cast iron borings	29.00-30.00
Low phos.	45.00-46.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	40.00-41.00
No. 1 machinery	43.00-44.00

Railroad Scrap

Rails, random lengths	47.00-48.00
Rails, 2 ft and under	51.00-52.00
Railroad specialties	48.00-49.00

CINCINNATI

(Brokers' buying prices: f.o.b. shipping point)

No. 1 heavy melting	40.00-41.00
No. 2 heavy melting	34.00-35.00
No. 1 bundles	40.00-41.00
No. 2 bundles	31.00-32.00
No. 1 busheling	40.00-41.00
Machine shop turnings	26.00-27.00
Mixed borings, turnings	23.00-24.00
Short shovel turnings	29.00-30.00
Cast iron borings	23.00-24.50
Low phos., 18 in.	*48.00-49.00*

Cast Iron Grades

No. 1 cupola	45.00-46.00
Heavy breakable cast	*40.00-41.00*
Charging box cast	38.00-39.00
Drop broken machinery	49.00-50.00

Railroad Scrap

No. 1 R.R. heavy melt.	*44.00-45.00*
Rails, 18 in. and under	57.00-58.00
Rails, random lengths	*51.00-52.00*

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	
No. 2 heavy melting	
No. 1 bundles	
No. 2 bundles	
Machine shop turnings	
Short shovel turnings	

Cast Iron Grades

No. 1 cupola	
Charging box cast	
Heavy breakable cast	
Unstripped motor blocks	
Brake shoes	
Clean auto cast	
Stove plate	

Railroad Scrap

No. 1 R.R. heavy melt	
Rails, 18 in. and under	
Rails, random lengths	
Rails, rerolling	
Angles, splice bars	

SEATTLE

(Delivered consumer's plant)

No. 1 heavy melting	
No. 2 heavy melting	
No. 1 bundles	
No. 2 bundles	
No. 3 bundles	
Machine shop turnings	15.00-
Mixed borings, turnings	15.00-
Short shovel turnings	15.00-
Electric furnace, No. 1	42.00-

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	*36.00-*
Heavy breakable cast	*32.00-*
No. 1 wheels	
Unstripped motor blocks	
Clean motor blocks	
Stove plate (f.o.b. plant)	*28.00-*
Brake shoes	*30.00-*

Railroad Scrap (Delivered consumer's plant)

Rails, random lenghs	

LOS ANGELES

No. 1 heavy melting	
No. 2 heavy melting	
No. 1 bundles	
No. 2 bundles	
Machine shop turnings	

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	43.00-

SAN FRANCISCO

No. 1 heavy melting	
No. 2 heavy melting	
No. 1 bundles	
No. 2 bundles	
No. 1 busheling	
Machine shop turnings	
Mixed borings, turnings	
Short shovel turnings	
Cast iron borings	
Cut structurals	
Heavy turnings	
Punchings & plate scrap	

Cast Iron Grades

No. 1 cupola	
Charging box cast	
Stove plate	
Heavy breakable cast	
Unstripped motor blocks	
Brake shoes	
Clean auto cast	
No. 1 wheels	
Burnt cast	
Drop broken machinery	

HAMILTON, ONT.

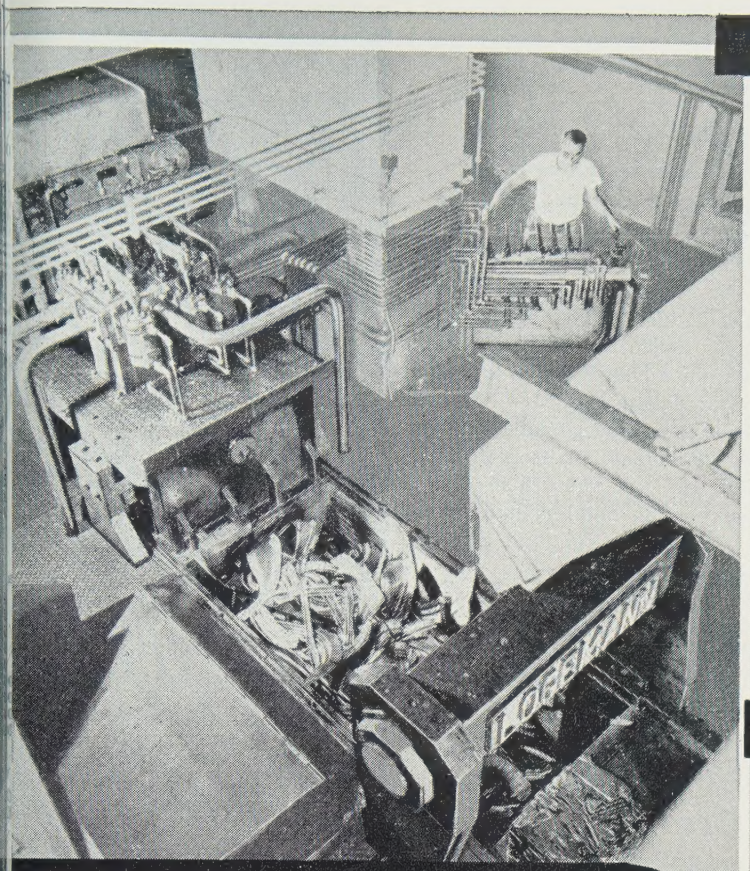
(Delivered prices)

No. 1 heavy melting	
No. 2 heavy melting	
No. 1 bundles	
No. 2 bundles	
Mixed steel scrap	
Mixed borings, turnings	
Rails, remelting	
Busheling, new factory: Prepared	
Unprepared	
Short steel turnings	

Cast Iron Grades†

No. 1 machinery cast	42.00-

†F.o.b., shipping point.



LOGEMANN Metal Balers

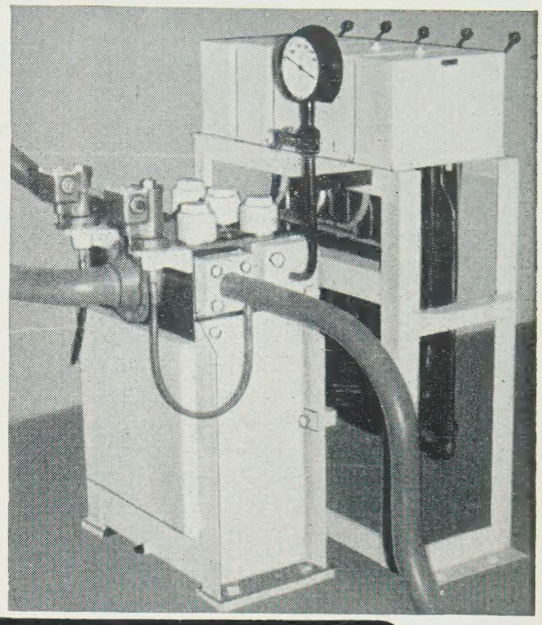
. . . powerful . . . compact . . . capable of high tonnage output!

In the large stamping plants and rolling mills where it is critically important that trim and stamping skeletons are quickly disposed of to avoid interference with production, LOGEMANN metal balers are relied on to keep ahead of production and pack such scrap into high density, self-cohering bricks for re-melting.

Hundreds of installations have established new records for tonnage, minimum maintenance, reliability, over extended periods of uninterrupted operation at high-speed.

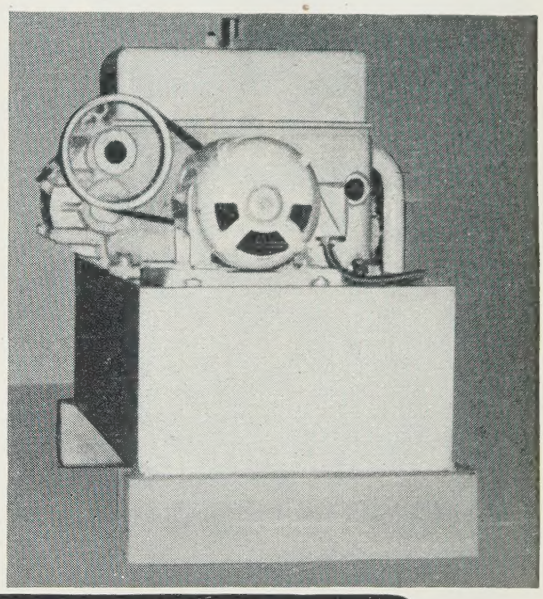
LOGEMANN models are not confined to the large sizes. Many small plants have found it profitable to use smaller sizes embodying the same features of reliability, at minimum operating cost. Interested parties are invited to write for details. Information as to the character of the scrap, tonnage to be handled in a given period of hours, and range of gauges is helpful in determining the proper model.

LOGEMANN



HYDRAULIC VALVES

The illustration shows a close-coupled hydraulic valve, operated by compressed-air cylinders for high-speed distribution of large gallonage of fluid at high pressure. LOGEMANN engineers have designed and built valves for many unusual as well as standard applications, and will welcome inquiries, with an outline of the conditions and requirements.



HYDRAULIC PUMPS

The opposed-cylinder close-coupled double pressure pump shown in the illustration is mounted on an individual tank to conserve floor space under present crowded plant and operating conditions. When requesting details, please indicate the nature of the service, pressure and gallonage requirements, and the fluid to be handled.

LOGEMANN BROTHERS CO.

126 W. BURLEIGH STREET • MILWAUKEE 10, WISCONSIN

(*Concluded from page* 283)

Shipments from interior points are increasing.

Pig Iron . . .

Pig Iron Prices, Page 271

Mystic Iron Works, Everett, Mass., has advanced prices for the fourth quarter $1.50 a ton to $62.50, f.o.b. furnace, for No. 2 foundry grade pig iron. Usual differentials are maintained for basic and malleable. Mystic did not advance prices in July as did other producers.

October continues to shape up as an active castings production month —probably the best since last May. This is supporting solid demand for pig iron from gray iron and malleable shops.

Shipments of pig iron are heavier to jobbing shops which also have comfortable order backlogs.

U. S. Steel Corp. lighted No. 7 blast furnace Oct. 1 at Homestead District Works' Carrie Furnaces, Rankin, Pa.

Iron Ore . . .

Iron Ore Prices, Page 281

Shipments of Lake Superior iron ore in the week ended Oct. 3 totaled 2,772,845 gross tons, reports the Lake Superior Iron Ore Association. Cumulative shipments in the 1955 navigation season now stand at 68,564,282 gross tons, up sharply from the 51,325,492 tons moved in the like period of 1954. In record 1953, the cumulative movement to the first week of October was about 79 million tons.

The U. S. Army Corps of Engineers will issue early next month plans and specifications for construction of a multimillion-dollar canal lock near Massena, N. Y. This project, to be known as the Robinson Bay lock, will be the first sizable contract on the U. S. side of the St. Lawrence Seaway not primarily for excavation or dike work. The lock will be 860 ft long, 80 ft wide and will have a maximum lift of 49 ft. The lock walls will vary from 105 to 115 ft high. About 1130 tons of reinforcing steel will be required. The government has set May 15, 1958, as the deadline for completion.

Tubular Goods . . .

Tubular Goods Prices, Page 270

Oil country goods are generally sold out through the remainder of this year. At the same time heavy demand is in prospect for early 1956.

One Pittsburgh producer says it could sell its entire first quarter output now if it were disposed to open

oks for that period. While some emakers plan to open first quar- books in a few weeks to take ad- ntage of the heavy demand, others, re cautious, will delay acceptances the next delivery period until vember.

The main problem for producers is filling of steadily increasing de- nd for high-alloy oil country tub- , used in the deepest wells.

Welded pipe sales continue to in- ase. A major producer has the gest backlog of unfilled orders in history. Commitments are being de for December delivery.

Cast iron pipe sellers in the Pacific rthwest report a lull in demand, in part to delayed deliveries re- ting from heavy placements early s year.

arehouse . . .

Warehouse Prices, Page 271

Distributors are experiencing onger demand for products on ich mills find themselves farthest ind on deliveries. They include d-rolled sheets, wide, hot-rolled ets, plates and wide flanged struc- als.

Unfortunately, distributors ex- ience shipment arrearages the ne as other mill customers and unable to accept more than a ited volume of proffered business. n the New England district, book- s are averaging close to 25 per t ahead of those a year ago. To et this heavier demand, stocks re better rounded out than was case two years back when the rehouses were shipping large ton- es.

A mild gray market is developing the East in structurals, although mium-priced volume is small.

isteners . . .

Bolt, Nut, Rivet Prices, Page 269

Railroad purchasing is definitely the upswing, says the sales man- r of a major producer of indus- l fasteners in the Pittsburgh dis- t. The large railroad car build- program is being reflected in mmitments extending into next r. Requirements for flood repair k in the East are heavy. Large ntity orders are coming from er areas, while automakers' needs tinue high.

ails, Cars . . .

Track Material Prices, Page 269

ncreased activity at the coal nes and growing maintenance needs steel plants are bolstering demand light rails. Sales for inplant mov- nt of products have been slow.

CLASSIFIED

Help Wanted

ELECTRICAL ENGINEER EXPERIENCED IN INDUCTION HEATING. Must be capable of designing induction heating and control components. Established concern. Salary open. Reply Box 312, STEEL, Penton Bldg., Cleveland 13, Ohio.

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For applied research and development work in the non-ferrous field . . . aluminum and copper alloys. Involves castings and/or rolling of mono and bimetals. Requires an aggressive individual capable of handling a variety of projects. This is a pleasant, permanent position with a large, nationally known manufacturer located in a medium-size, midwest city. Congenial working conditions, liberal vacations, insurance, welfare and pension benefits. Excellent starting salary with every opportunity for advancement. Reply in complete confidence stating education, experience, references, etc. Reply Box 316, STEEL, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

GENERAL SUPERINTENDENT
Steel Fabrication. 30 years practical experience, light, medium, heavy fabrication and electric welded tubing processes and fabrication. Prefer plant of 100 to 1,000 employees. Reply Box 318, STEEL, Penton Bldg., Cleveland 13, Ohio.

STRUCTURAL ENGINEER AND MANUFACTURERS SALES REPRESENTATIVE 14 YEARS EXPERIENCE, 4 YEARS IN OWN BUSINESS. NEED GOOD POSITION WITH REAL FUTURE OR WILL CONTRACT TO FURNISH COMPLETE STRUCTURAL SHOP DETAILS TO FABRICATORS AT A REASONABLE AGREED RATE. REPLY TO WAGNER EQUIPMENT & ENGINEERING SERVICE, BOX 7997, KANSAS CITY 29, MISSOURI.

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